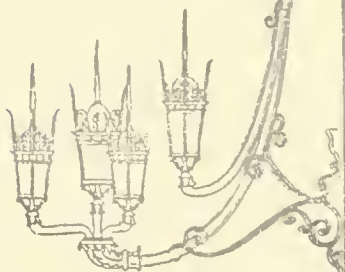


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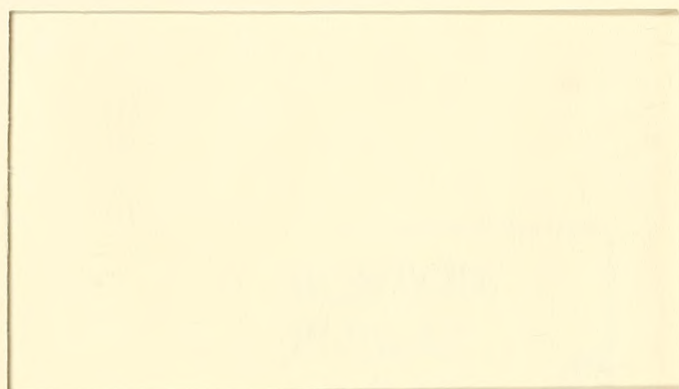
Engineers and
Scientists



16-1-

**PHASE I - SITE EVALUATION
ACDC AND CEDC
BRA PARCELS A AND B
BOSTON, MASSACHUSETTS**

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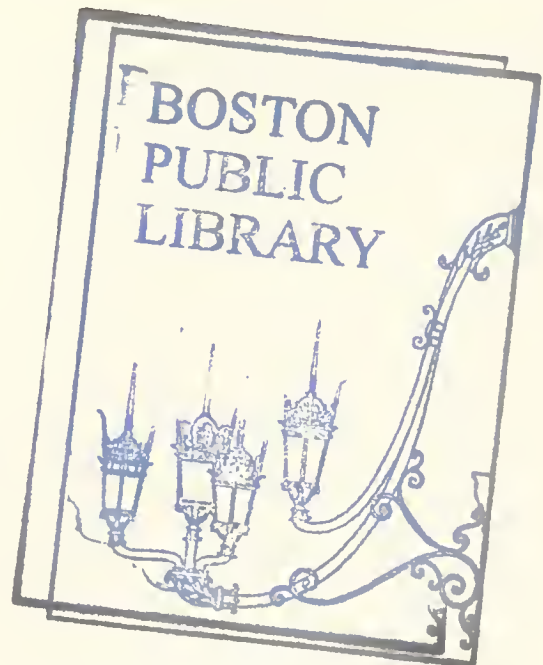


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**PHASE I - SITE EVALUATION
ACDC AND CEDC
BRA PARCELS A AND B
BOSTON, MASSACHUSETTS**

PREPARED FOR:
ACDC and CEDC
Boston, Massachusetts

PREPARED BY:
GZA GeoEnvironmental, Inc.
Newton Upper Falls, Massachusetts

April 1992
File No. 12854





April 10, 1992
File No. 12854-C

Ms. Carol Lee
ACDC and CEDC
360-B Tremont Street
Boston, Massachusetts 02116

Re: Phase I - Site Evaluation
BRA Parcels A and B
Washington Street
Boston, Massachusetts

Dear Ms. Lee:

In accordance with our proposal dated February 10, 1992, and subsequent authorizations, GZA GeoEnvironmental, Inc. (GZA) has conducted a Phase I - Limited Site Investigation of the BRA Parcels A and B on Washington Street in Boston, Massachusetts. This Report has been prepared in accordance with the Limitations and Terms and Conditions set forth in Appendix A.

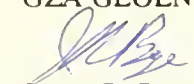
This Report describes the conditions observed by GZA at the study site. The text presents the results of the site reconnaissance, site history research, regulatory agency file review, subsurface exploration program, and chemical screening and analyses of soil and water from the site. Conclusions of our study are provided in Section 9.00.

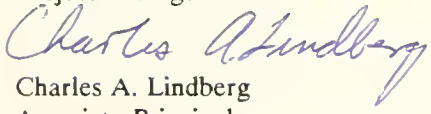
It is our opinion that the sites should be classified as "non-priority" disposal sites and that they are eligible for waivers of Massachusetts Department of Environmental Protection (DEP) approvals for further investigation/remediation. Based on these findings we have also completed Preliminary Assessment Reports, Interim Site Classification Forms and Waiver Applications for the two sites. These are provided separately.

We have appreciated the opportunity to work with you on this project.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.


James R. Bossange
Project Manager


Charles A. Lindberg
Associate Principal


Sara R. Hanna
Consultant/Reviewer

JRB/CAL:lr
Attachment: Report

cc: Matthew Garrison, Esq. - 1 copy

320 Needham Street
Newton Upper Falls
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617-969-0050
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A Subsidiary of GZA
GeoEnvironmental
Technologies, Inc.

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1.00 INTRODUCTION



In accordance with our proposal dated February 10, 1992, GZA GeoEnvironmental, Inc. (GZA) has completed a Phase I - Limited Site Investigation of the BRA Parcels A and B site on Washington Street in Boston, Massachusetts. Our study was completed on behalf of the Asian Community Development Corporation (ACDC) and the Chinese Economic Development Corporation (CEDC).

According to the Massachusetts Contingency Plan (MCP), 310 CMR 40.000, the purpose of the Phase I - Limited Site Investigation is to confirm whether or not the location is a disposal site and, if the site is a disposal site, to provide information necessary for the Massachusetts Department of Environmental Protection (DEP) to classify the site pursuant to 310 CMR 40.544. A Phase I - Limited Site Investigation is not intended to be a comprehensive investigation, but rather an initial study that provides the DEP with the necessary information to classify the site under the provisions of the MCP.

The scope of services included: a site visit; a review of site history; contact with certain local and state officials, and review of certain state and federal files and lists regarding possible environmental concerns at or near the subject site; subsurface explorations in the form of test borings and groundwater monitoring well installations; sampling of soil and the groundwater monitoring wells; limited screening/analysis of the soil and groundwater samples at GZA's Newton Environmental Chemistry Laboratory (ECL) and Matrix Analytical, Inc. of Hopkinton, Massachusetts; and the preparation of this Phase I report.

2.00 BACKGROUND

The following paragraphs describe the physical layout of the site, its hydrogeologic setting and utilities on the site.

2.10 SITE LOCATION

The site is located near the Chinatown section of Boston just to the north of the Massachusetts Turnpike. A site locus is provided as Figure 1, and a site plan is presented on Figure 2. Parcels A and B are both on the east side of Washington Street, and Pine Street extends diagonally to the southeast from Washington Street across both Parcels A and B. Parcel A consists of two lots: Lot R3A2 is

approximately 32,745 square feet, and lot R3A1 is approximately 3,594 square feet. Lot R3A1 and a small portion of lot R3A2 are north of Pine Street, and the larger portion of lot R3A2 is south of Pine Street. Most of Parcel B, which consists of one lot (lot R3B), is north of Pine Street; however, the southwest corner of Parcel B is to the south of Pine Street.

The site is in a mixed residential and commercial neighborhood. Oak Street, beyond which is a parking lot, is to the north of the site, and Washington Street, beyond which is the Josiah Quincy Elementary School, is to the west of the site. Marginal Street, beyond which is a below grade portion of the Massachusetts Turnpike, is to the south of the site. Residences and the Chinese Evangelical Church are to the east of the site. Maple Place abuts the northern portion of the site, and a 28-foot-wide section of property that is labeled as "public" separates a small portion of the study site (lot R3A1) from the main portion of the site (lots R3A2 and R3B). The Tufts/New England Medical Center is approximately 100 feet to the northwest of Parcel B.

Site latitude and longitude coordinates are 42° 20' 48" north and 72° 3' 49" west, respectively. Site Universal Transverse Mercator (UTM) coordinates are 4,690,350 meters north and 329,775 meters east.

2.20 TOPOGRAPHY AND DRAINAGE

According to the U.S. Geological Survey topographic quadrangle map of the area (Boston South Quadrangle, 1979), the site is located approximately 1/2 mile west of Fort Point Channel. Based on a preliminary review of the area's topography and location, and data collected during a groundwater elevation survey, groundwater flow is to the southeast. However, localized flow directions in the vicinity of the site may vary as a result of underground utilities (e.g., storm drains, sewers, utility conduits) or heterogeneous subsurface conditions.

Subsequent references to upgradient or downgradient directions in relation to the site are relative to GZA's anticipated southeasterly direction of groundwater flow.

2.30 SITE DESCRIPTION

Site reconnaissances were performed on Parcels A and B on two dates: June 25, 1991 and February 18, 1992. Photographs of the site are included with the Figures section of this report.

Parcel B is covered by a building, a playground, landscaped land and a former vegetable garden. An abandoned six-story masonry building is along Washington Street. Its interior was observed by GZA geologist Richard Ponti on June 25, 1991; however, the building interior was not observed during our February 18, 1992 site

reconnaissance since the building appeared to have fallen into further disrepair. Most of the building windows were broken or boarded up.

Our June 25, 1991 site reconnaissance indicated that each of the floors contained one staircase and elevator shaft in the central area of the building and one staircase at the rear of the building. Sinks, showers and bathrooms are located on the rear corners of the structure on each floor.



The first floor contained trash, desks, broken video games, a few empty spray paint cans, some automotive paints and one empty 55-gallon drum labeled as a degreaser. The south portion of the building appeared to have been an automotive bay or garage at one time (see Photograph No. 2). Small isolated surficial oil and grease stains were observed on the concrete floor. No floor drains were observed. The southeast corner of the building contained one, approximately 275-gallon aboveground fuel storage tank. GZA could not determine if the tank was still storing a liquid. A 3-foot by 4-foot surficial stain was observed on the concrete floor near the tank. The rest of the floors were wood and contained broken glass, wood debris, broken furniture, printing presses, bench lathes, empty 1-gallon and 5-gallon paint cans, clothing, children's books, toys, records, ceiling tiles and a few mattresses. Each of the sinks and bathrooms were observed, and no evidence of oil or hazardous materials were noted. The sixth floor bathroom pipes appeared to have white fibrous insulation, possibly asbestos, around the pipes.

The basement contained a large boiler and a cinder block containment vault at the southeast corner. GZA did not have access to observe the inside of the vault at the time of the visit. The basement also contained large quantities of wood debris, glass, and broken furniture. Two 4- to 6-inch-diameter pipes adjacent to the ceiling also appeared to contain white fibrous insulation that could be asbestos (It is noted that an asbestos survey of the building was not part of our current scope of work). No evidence of a release of oil or hazardous materials was observed in the building except for the minor floor staining. In addition, white fibrous insulation, possibly asbestos, may be present around a few of the pipes in the basement and the sixth floor.

A small communal garden is on the north portion of the study site, while a landscaped area is on the east portion of the study site. A playground is on the eastern portion of the site, and includes a paved basketball court and various recreational apparatus such as a swing set. GZA did not observe stressed vegetation or significant surficial staining in the landscaped land or playground areas.

Automobile parking areas are on the southern portion of the site. An unpaved gravel parking area, surrounded by a chain link fence, is located south of the playground area on the eastern portion of the site on Parcels A and B. A portion of a paved parking lot is to the south of Pine Street on the southwest portion of Parcel B and most of Parcel A. According to the parking attendant at the paved parking area south of



Pine Street, the unpaved lot is used by employees of the Josiah Quincy School, and the paved parking area is operated by New England Medical Center. Parcel A was occupied by automobiles on paved and unpaved parking areas during the site visits. The portion of Parcel A that is to the south of Pine Street was a paved parking lot, and the portions of Parcel A north of Pine Street were part of an unpaved parking lot. Oil-like stains typically associated with automobile parking areas were observed on the parking lots. A small guard shack was on the paved parking lot to the south of Pine Street on Parcel A. Three catch basins believed to be connected to the a storm drain beneath Pine Street were observed near the east side of the paved parking area to the south of Pine Street.

2.40 SITE UTILITIES

Several utilities are on the site; refer to the utility plan that is attached as Figure 4 for approximate locations of these lines. Underground utilities (water, natural gas, sewer and electric) are located under Pine Street. Abandoned underground telephone lines and water lines enter onto the southwest section of Parcel A's paved lot from Washington Street. The abandoned telephone lines end in the southeast section of Parcel A's main lot, and an abandoned water line ends in the southwest section. According to historical atlases discussed in Section 3.00, a street formerly extended onto the site at this location. Also, in Parcel A's paved lot, a drainage line runs north-south on the eastern section of the parking lot. An abandoned electrical line extends onto Parcel B from Pine Street, and an abandoned telephone line extends into Parcel B from Oak Street. Natural gas, water and electric lines extend onto the northeast section of Parcel B from Oak Street, and natural gas, water, electricity and sewer extend to the abandoned building on the northwest portion of Parcel B from Washington Street.

3.00 HISTORY OF THE SITE

To obtain information regarding the history of the site, GZA contacted the Boston Redevelopment Authority (BRA), Boston Assessor's Office, Building Department, and the Sanborn Mapping & Geographical Information Service of Pelham, New York.

3.10 PARCEL A

Sanborn Maps of the vicinity provided the following information (see Appendix B). An 1867 map indicated that Parcel A was divided into a number of small properties, including two carpentry shops and livery stables. An 1885 map indicates "Protective Department No. 2" at the southeast portion of the site, and a carpentry shop on the northeast portion of the site. Furniture and carpet businesses were also indicated to be on the western portion of the site. An 1895 map indicates a painting shop on the



northeast portion of Parcel A and a stained glass business in the southeast portion of the parcel in addition to several other buildings. As of 1909, there appears to have been dry goods stores and carpentry shops with a blacksmith at the former "Protective Department" location. A 1929 map indicates that the Rufus F. Dawes Hotel extended from the present-day Parcel B into the northeast portion of Parcel A; a Boston Edison substation was located possibly on and/or just to the east of the southeast portion of Parcel A. A 1951 map shows the Dawes Hotel still in place and the remainder of Parcel A still occupied by several small buildings. The former Boston Edison substation was indicated to be occupied by "Electric Motor Rep." A 1989 map shows the site as it is today, occupied by parking. It is apparent that a number of structures which formerly occupied the site were demolished prior to 1989.

Additional historical information was difficult to obtain due to a lack of specific numbered street addresses for the site. Some historical maps indicate portions of the site to be addressed as 664 to 890 to 908 Washington Street, 1-13 Pine Street and 220 to 254 Marginal Street; we believe that these addresses are accurate relative to property lines delineated by BRA Parcel A. The Assessor's Office indicated that the BRA owned property in the area of the site at unspecified numbered addresses on Oak Place, Oak Street and Broadway. No information on past owners of the site was obtained from the Assessor's Office.

The Building Department files indicate that in 1921, a permit was issued for the address of 902 Washington Street to construct a building to house unspecified types of stores. A 1975 Building Department file for 902 and 908 Washington Street was issued to take down a building and fill the property to grade, and 1982 and 1983 permits granted permission for the 902 and 908 Washington Street properties to be used as a parking lot.

According to Mr. Edward Chang of CEDC, the current owners of lot R3A1 and R3A2 are CEDC and the Boston Redevelopment Authority (BRA).

3.20 PARCEL B

The same Sanborn maps were reviewed for Parcel B. The 1867 map indicated that the footprint of the current building was occupied by an armory; the rest of the site appears to have been small commercial properties. The 1885 map indicates that the buildings along Washington Street housed furniture dealers, carpet dealers and a roller skating rink and that the buildings in the northeast portion of the site are labeled "tenements." The 1895 map shows a building on Washington Street partially converted to a Salvation Army hotel and furniture dealers and tenements still present. The 1909 map indicates "elevated railroad tracks" extending behind the Salvation Army hotel. The 1929 map shows that buildings along Pine Street (southeast portion of the site) were replaced by the Rufus F. Dawes Hotel, the Salvation Army is in the Washington Street building, and the elevated railway tracks remain on the site. The



1951 map again shows Parcel B to be covered by several buildings including the Dawes Hotel and that the elevated railroad were still recorded at the site. The 1989 map shows the site to be covered by the present site building, elevated railroad tracks and a playground. All of the historical maps indicate that a street, originally labeled as Ash Street and later as Oak Place, extends onto Parcel B from the north.

Assessor's Office records reviewed in 1991 listed Edward Mascoll, et al. (884 Washington Street) and Samuel James, et al. (888 Washington Street) as property owners. City directories indicate that the building was occupied by a variety of businesses (appliance stores, pawnbrokers, furniture stores) from 1933 to 1978, when it was taken over by the Chinatown Boys Club.

Building Department records indicate that the existing building includes the addresses of 882 to 892 Washington Street. Building permits dating back to 1916 reflect both retail and manufacturing activity as well as several minor structural changes. In 1955, a company called Cambridge Engraving either sold or manufactured signs at 888-890 Washington Street. In 1972 and 1976, permits were issued to the BRA to bring the building up to code standards for the Boys Club of Chinatown. As of 1987, the owner of 882-992 Washington Street was listed as Teradyne Corporation. GZA did not observe any demolition permits in the Building Department records, although the buildings along Pine Street and Oak Street were demolished sometime between 1959 and 1989 according to the Sanborn maps. Additionally, the elevated railway tracks (a portion of the Massachusetts Bay Transportation Authority's "Orange Line") were removed sometime before June 1989.

According to Ms. Carol Lee of ACDC, the Oak Terrace Limited Partnership presently owns Parcel B.

4.00 OIL AND HAZARDOUS MATERIAL USAGE

GZA observed no current use of hazardous materials or oil at the site. However, during our initial site visit, a few small containers of spray paint, automotive paints and an empty 55-gallon drum labeled as a degreaser were observed in the first floor of the building. In addition, the southern section of the first floor that appear to have been formerly used as an automotive bay or garage, and therefore hazardous materials and oil may have been formerly stored and used in this area of the building. Other than minor surficial staining typically associated with parking areas and random rubbish disposal, we did not observe surficial evidence of the presence of oil or hazardous materials on the exterior portions of the site.

5.00 REGULATORY INFORMATION CONCERNING SITE AND VICINITY



Certain state and local agencies were contacted and certain state and federal files and lists reviewed to assess whether hazardous materials may have been released into the soil or groundwater at or near the site. Some of the information was developed by telephone contact; other information is the result of direct interviews and visits. The information made available to GZA during these visits, interviews and file reviews is summarized in the following paragraphs.

5.10 LOCAL

To obtain information concerning the possible release of hazardous material or oil at or near Parcels A and B, GZA contacted the Boston Health, Fire and Water Departments and the Clerk's Office.

The officials at the Fire Department and Clerk's Office indicated that they had no records of underground storage tanks (USTs) at the site. However, please note that GZA was unable to determine how the former site buildings were heated. It is possible that heating oil may have been used to heat the buildings and may have been stored in aboveground or underground storage tanks and not reported to the municipal Fire Department. GZA observed no records of demolition of the site buildings; if storage tanks had been present, it is possible that the tanks may have been left on the site during demolition. In addition, Fire Department records indicated no release of oil or hazardous material at the site. However, Fire Department personnel recalled a gasoline spill on Kneeland Street approximately two years ago.

The officials at the Water Department indicated that no public or private water supply wells are at or in the area of the site. In addition, the buildings in the area were indicated to receive their drinking water from the Massachusetts Water Resource Authority (MWRA).

The Health Department officials also indicated that their files indicated no information regarding the storage of hazardous materials or oil at the site.

5.20 STATE

Files made available to GZA at the Massachusetts DEP Northeast Regional Office were reviewed on April 1, 1992.

The DEP Incident Response Files and Spills Database, updated to November of 1991, indicated that 18 spills or releases of oil or hazardous materials have occurred within approximately 1/8 mile of the site:



- Medical Vet. Building, 136 Harrison Avenue: December 4, 1987 spill of various acids and cresol dithiol inside building, no floor drains affected; clean up by Clean Harbors.
- 35 Kneeland Street: 90 gallons of No. 4 fuel oil released during tank test on June 19, 1987; clean up by Clean Harbors.
- Corner of Kneeland and Washington Streets: over 2,000 gallons of cable oil released September 9, 1989 when a contractor jackhammered into cable line; clean up by Clean Harbors.
- Sunoco station located at 976 Washington Street reported two spills of gasoline in 1991; cleaned by Groundwater Environmental Services.
- Atlas Oil, 100 Shawmut Avenue: December 21, 1983 release of 10 gallons of No. 4 fuel oil; clean up by Pollution Control Unlimited (PCU).
- Exxon, Kneeland Street: February 10, 1984 release of 50 gallons of jet fuel; clean up by PCU.
- Tufts University, 136 Harrison Avenue: November 3, 1984 release of 1 gallon of toluene; clean up by Tufts; also December 4, 1987 release of 1/2 to 1 liter of various acids; clean up by Clean Harbors.
- New England Medical Center Hospital, 35 Kneeland Street: June 19, 1987 release of 90 gallons of No. 4 fuel oil; clean up by Clean Harbors.
- BECO, unidentified location on Shawmut Avenue: August 4, 1987 release of unknown quantity transformer oil; no clean up contractor listed.
- Boston University, Harrison Avenue: December 14, 1987 release of unknown quantity of unknown chemicals; clean up by Advanced Em. Tech. Company.
- MBTA, 500 Broadway: July 27, 1990 release of unknown quantity of medical waste; clean up by Clean Harbors.
- Boston Edison, corner Tremont and Kneeland Streets: September 19, 1989 release of 1,000 gallons of cable oil; clean up by Clean Harbors; also, October 31, 1989 release of unknown quantity of cable oil at unspecified address on Kneeland Street; clean up by Clean Harbors.
- Unidentified location on Kneeland Street: September 23, 1989 release of unidentified quantity of gasoline; clean up by Fire Department/Department of Public Works (DPW).

- Munson Transport, unlisted address on Kneeland Street: July 7, 1990 release of unknown quantity of diesel fuel; no clean-up contractor listed.
- Boston Herald, 300 Harrison Avenue: May 31, 1989 release of unknown quantity of gasoline/diesel fuel; clean up by Zecco, Inc.

Most of the reported quantities spilled are relatively small, and clean-up contractors were generally retained to clean up the spills; it is GZA's opinion that the spills listed above are unlikely to have had an adverse impact on the study site.

The DEP January 15, 1992 "List of Confirmed Sites and Locations To Be Investigated" (LTBI) identified two confirmed sites and an LTBI within 1/8 mile of the study site. Discount Fuel located at 739-745 Washington Street is listed as a confirmed site with a Phase 3 status, and New England Medical located at 810-864 Washington Street is listed as a confirmed site with a Phase 2 status. The Discount Fuel site is approximately 1/8 to 1/4 mile northwest and possibly upgradient of the study site; the New England Medical site is across Oak Street from Parcel B. New England Medical is a waiver site, in which the DEP has authorized a private party to proceed with cleanup actions without further DEP oversight. A Sunoco station located at 976 Washington Street is listed as an LTBI with preliminary assessment status. The Sunoco station is approximately 1/8 to 1/4 mile southwest and not upgradient of the study site.

The DEP February 6, 1992 Northeast Regional Sites Database indicated, along with the three previous sites, Boston Herald located at 300 Harrison Avenue and Waterford Place at 180 Shawmut Avenue as reserved sites with preliminary assessment status. A reserved site is an LTBI of lower priority than those included on the DEP's published list. Boston Herald is approximately 1/8 mile southwest and not upgradient of the study site.

The DEP Site Assessment files regarding the New England Medical Center (previously an MBTA station) indicated that fill samples were found to contain elevated levels of total petroleum hydrocarbons (TPHs), polynuclear aromatic hydrocarbons (PAHs), and metals. The waiver application filed for the New England Medical Center site indicated that the likely remedial response action would consist of excavation and removal of contaminated fill.

Site Assessment files for the Boston Herald site contained a letter dated July 12, 1989 from Metcalf & Eddy Technologies, Inc. of Northborough, Massachusetts to the Department of Environmental Quality Engineering (DEQE; now DEP). The letter indicated that free phase weathered petroleum product was discovered during the excavation of two 20,000-gallon fuel oil tanks near the northeast corner of the Herald building. The product was pumped from the ground using a vacuum truck, and contaminated soil was stockpiled on polyethylene sheeting. Eight monitoring wells

were installed; free product was reported in two wells. The letter indicated that a Phase I - Site Investigation report was forthcoming; GZA did not find this report in DEP files.

DEP site assessment files for the Waterford Place site at 180 Shawmut Avenue contained a report by Briggs Associates, Inc. of Rockland, Massachusetts, dated August 9, 1989. The Briggs report indicate that a localized area of stained soil was encountered during excavations for pile caps for a new building. Approximately 100 cubic yards of the stained soil was excavated and stockpiled. Subsequent analysis of the soil by Briggs indicated the presence of less than 100 parts per million (ppm) TPH in the samples analyzed. No volatile organic compounds (VOCs) were detected. The source of the oil was believed to be a crushed heating oil tank which was buried in place when a former building at the site was demolished in the early 1970s. The Briggs report stated that the stained soil was to be disposed of by BFI, Inc. at Northern Disposal Company in East Bridgewater, Massachusetts pending BFI's analysis of the material. DEP files also contained a Bill of Lading indicating that approximately 150 cubic yards of contaminated soil was removed from the 180 Shawmut Street property to GCR in Peabody, Massachusetts on August 11, 1989.

GZA also reviewed the DEP Water Supply Protection Atlas, which did not indicate the presence of the following potential sources of environmental contamination within 1/4 mile of the study site; landfills, salt storage sites, surface impoundments, junkyards or hazardous waste sites. The Atlas additionally indicated no public water supply wells or reservoirs within 1/4 mile of the site.

5.30 FEDERAL

GZA reviewed the March 3, 1992 Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) list of hazardous waste generators, transporters and treatment/storage/disposal facilities registered under the RCRA. This list identified ten such companies within approximately 1/8 mile of the study site; of these, eight were listed as small quantity generators and two (New England Medical Center and Tufts University Medical School) were listed as large quantity generators. The hazardous waste generators in the vicinity of the subject site are listed in Table 1.

The EPA March 4, 1992 Facility Index System (FINDS) list of companies involved with any of 12 EPA monitoring programs included ten companies within approximately 1/8 mile of the study site; these companies are also listed on Table 1. All of the companies are included under the Hazardous Waste Data Management System (RCRA information) but the FINDS list includes three companies which were listed on the RCRA list, and does not include three other companies which were listed on the RCRA list.



The March 4, 1992 Comprehensive Environmental Response, Compensation and Liability Act Information System (CERCLIS) list of sites for possible investigation under the Federal Superfund program indicated no listings within 1/8 mile of the study site. EPA's February 25, 1992 National Priority List of Federal Superfund sites in Massachusetts did not include any sites in Boston.

Additionally, the 1981 and 1986-1992 EPA lists of companies with National Pollutant Discharge Elimination System (NPDES) permits were reviewed. They showed no companies in the vicinity of the site with NPDES permits.

EPA's Emergency Response Notification System (ERNS) list dated February 24, 1992 of spills reported to the EPA did not indicate any spills reported at or within 1/8 mile of the study site.

6.00 FIELD EXPLORATION, SAMPLING AND ANALYTICAL PROGRAM

GZA completed a field exploration program as part of the present evaluation to assess the presence of oil or hazardous materials in soil and groundwater at the site. This program consisted of the execution of a total of 19 borings (10 on Parcel A and nine on Parcel B), the installation of 14 monitoring wells (seven on each parcel), and the collection and screening analysis of soil and water samples.

To the extent feasible, initial (June 1991) exploration locations were selected to obtain soil and groundwater samples from generally upgradient and downgradient areas of the site. Boring locations were also selected so as to provide geotechnical information for the proposed site development. Locations of the borings completed during the second phase (February 1992) of exploration were selected based on the results of the initial field work. These were intended to provide additional soil and water samples for more comprehensive chemical analyses in areas of suspected contamination and to provide additional site coverage. An Exploration Location Plan is attached as Figure 2.

Similar field procedures and analytical techniques were used for both parcels, and the types of subsurface materials encountered on the two parcels were similar. Therefore, a general discussion of field procedures and geologic conditions encountered, pertaining to both parcels, is presented below. Results of the chemical analyses of soil and groundwater samples are discussed separately by parcel.

6.10 SUBSURFACE EXPLORATIONS AND MONITORING WELL INSTALLATIONS



Between June 4 and 28, 1991, 14 borings (GZA-1 through GZA-8 and GZB-1 through GZB-6) were completed by GZA Drilling, Inc. of Brockton, Massachusetts. Five additional borings (GZA-9 through GZA-13) were completed by GZA Drilling on February 24, 1992. Hollow stem auger techniques were employed without the use of water or other drilling fluids for shallow borings. Some of the June 1991 borings were advanced to greater depths (up to 107 feet) to provide geotechnical data for building foundation design. These deep borings were advanced using drive and wash methods through the overburden and a diamond bit with NX core in bedrock.

A monitoring well consisting of 10 to 15 feet of 1.5-inch-diameter PVC wellscreen attached to a solid PVC riser pipe was installed in 14 of the borings. All PVC attachments were completed without the use of solvents or glues to prevent contamination. The wellscreen was set to span the water table encountered in the boring during drilling. A filter of clean silica sand was placed in the annular space around the wellscreen, and a bentonite clay seal was placed above this filter sand. Each well was completed with a curb box at the ground surface. Well installation details are presented on the boring logs in Appendix C.

6.20 SOIL AND WATER SAMPLING

Split spoon samples were obtained by Standard Penetration Tests at 5-foot intervals during the drilling operations. Soil samples were classified by the on-site geologist; boring logs developed by GZA are attached as Appendix C. A portion of each soil sample was collected in a clean glass jar, stored in an ice-packed cooler and transported under chain-of-custody procedures to GZA's Environmental Chemistry Laboratory (ECL) for chemical screening. In addition, two surface soil samples were collected from the site on March 23, 1992.

On June 19-29, 1991 and February 24 and March 3, 1992, GZA personnel sampled the monitoring wells at the study site. Groundwater samples were obtained using 5-foot stainless steel bailers with Teflon ball check valves. A separate laboratory-cleaned bailer was used for each well to avoid cross contamination. Three times the initial standing volume of the groundwater in the well was evacuated to remove stagnant water, and the well was allowed to recharge. Water samples were collected in hydrochloric acid preserved 40-ml vials with Teflon septa, 1-liter amber jars, and in 8-ounce glass jars. The samples were kept cool and delivered under chain-of-custody procedures to GZA's ECL.

GZA measured water levels in each monitoring well with an electronic water level reader at the time of sampling. The depths to water table are indicated on the well logs in Appendix C.

6.30 GROUNDWATER FLOW DIRECTION MEASUREMENTS

To estimate the direction of site groundwater flow, GZA conducted an elevation survey on March 3, 1992 using laser level techniques and a local benchmark (a bolt on a fire hydrant as shown on Figure 3). GZA surveyed the well casing elevations and measured the depths to groundwater in the wells. The water levels in the wells are presented on Table 2 and on the boring logs in Appendix C. Groundwater elevations were calculated by subtracting groundwater depths from the wellhead elevations. Survey data and relative groundwater elevations are provided on Table 2, and a groundwater contour plan is provided as Figure 3.

6.40 CHEMICAL SCREENING OF SOIL AND WATER SAMPLES

Soil samples collected from the site were screened in GZA's ECL for total VOCs using an H-Nu Model PI-101 photoionization detector (PID) with a 10.2 electron volt lamp. The PID measures relative levels of VOCs referenced to a benzene in air standard. Although the PID screening cannot be directly used to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator of the levels of VOCs in each sample. Laboratory PID screening results are presented on the boring logs in Appendix C, and summarized in Tables 3 and 6. A discussion of the results of the screening analyses is provided in Section 7.20.

Based on PID screening results, additional chemical screening by static headspace gas chromatograph (GC) techniques was performed on selected soil samples using a Hewlett Packard Model 5890A GC. The GC screening analysis permits the tentative identification and approximate quantification of individual VOCs. GC screening results and a description of GZA's GC screening procedures for soil are included in Appendix D; results are discussed in Section 7.20 and presented in Tables 4 and 7.

Water samples were also screened for VOCs using the GC and static headspace techniques. The GC screening procedures and results are presented in Appendix D; results are discussed in Section 7.20 and presented in Tables 5 and 8.

In addition, water samples were screened for pH and specific conductance within 24 hours of collection. The pH is a measure of the acid or basic nature of water, and specific conductance is a measure of dissolved ions in water. An Orion Research Model EA 940 Expandable Ionanalyzer was used to measure pH and an YSI Model 34 Conductivity Meter was used to measure specific conductivity. Results are presented in Tables 5 and 8 and discussed in Section 7.20.

Selected soil and groundwater samples were analyzed for TPH content by infrared (IR) spectroscopy, and additional analyses for petroleum hydrocarbons (PHCs) were conducted using GC techniques using modified ASTM Method D-3328. Selected water and soil samples were also screened at GZA's ECL for semi-VOCs. One

composite soil sample from each site was submitted for broad spectrum chemical analyses which included PCBs by EPA Method 8080 (GZA ECL) and toxicity characteristic leaching procedure (TCLP) for metals, pesticides and herbicides by Matrix Analytical, Inc. of Hopkinton, Massachusetts . The analytical procedures and results are included in Appendix D; results are discussed in Section 7.20 and summarized in Tables 4, 5, 7, and 8.



7.00 FIELD EXPLORATION AND ANALYTICAL RESULTS

The following sections summarize the soil conditions encountered as well as the results of chemical screening of soil and water.

7.10 SUBSURFACE CONDITIONS

Soil conditions are summarized from the boring logs attached as Appendix C. Each of the borings encountered between 6 and 17 feet of granular fill overlying silts and clays. Borings GZA-2, GZA-4, GZB-1 and GZB-3 were advanced approximately 10 to 16.5 feet into bedrock. These borings encountered glacial till at depths ranging from approximately 71 to 87 feet below ground surface; the thickness of the till ranged from approximately 4 to 12 feet. The depth to bedrock ranged from approximately 75 feet (GZA-4) to 94.5 feet (GZB-1) below existing grade.

7.20 GROUNDWATER FLOW

Results of our groundwater elevation survey (Figure 3) indicate that groundwater flows to the southwest toward the subgrade section of the Massachusetts Turnpike and Fort Point Channel. The difference in the elevation of the watertable on the site is approximately 5 feet; the lowest watertable elevation is in well GZA-13, which is on the southeast portion of the site. Depths to groundwater ranged from approximately 6 to 13 feet based on our March 1992 measurements.

7.30 RESULTS OF CHEMICAL SCREENING ANALYSES

Results of chemical screening and analyses of soil and groundwater samples from Parcels A and B are summarized below. Laboratory reports are contained in Appendix D.

7.31 Parcel A

A total of 84 soil samples and 13 groundwater samples (six from the June 1991 sampling round and seven from the February/March 1992 sampling round) were

collected for chemical screening and analysis; results are described below and summarized in Tables 3, 4, and 5.

Soil

PID readings did not indicate detectable levels of VOCs (no positive meter response) in 71 of the 84 soil samples collected from Parcel A (Table 2). PID readings ranging from 0.1 to 1.8 ppm in nine of the 13 samples which registered a positive meter response. GZA considered these readings to be within the background range typically encountered in urban areas. Slightly elevated PID readings (2.8 to 8.2 ppm) were reported in samples GZA-2, S-5; GZA-4, S-1 and S-2; and GZA-5, S-3. With the exception of GZA-2, S-5, all of these samples were collected from fill materials.

The three samples which indicated slightly elevated PID readings and eight other samples were screened for VOCs using static headspace GC techniques. VOCs were reported in four of these samples at levels close to the detection limit of the method employed. Specific compounds reported included methyl-t-butyl ether, toluene, ethyl benzene and xylenes. These compounds are common constituents of petroleum products, such as gasoline. Unknown compounds which may be other petroleum-related hydrocarbons were also reported in samples from GZA-4, GZA-5 and GZA-8.

Based on the PID screening data, 11 soil samples were analyzed for TPH by IR methods; TPH concentrations ranged from 18 to 5,400 ppm (Table 3). Two individual samples (GZA-11, S-4 and GZA-13, S-2) and two composite samples (composite A consists of samples S-1, S-2 and S-3 from GZA-11 and samples S-1 and S-2 from GZA-13, and Composite 1 consists of samples S-1 and S-2 from GZA-13) were analyzed for PHCs by GC methods; results ranged from 53 to 440 ppm. TPH IR methods are subject to a number of interferences which can artificially elevate measured PAH concentrations. Accordingly, we believe that the GC results more accurately reflect conditions at the site.

The samples screened for PHCs were also screened for semi-volatile organic compounds. A number of polycyclic aromatic hydrocarbons (PAHs) were reported, at total concentrations ranging from 5.9 to 82 ppm. PAHs are byproducts of coal combustion and automobile exhaust and are commonly found at similar concentrations in urban fill. No other semi-volatile organic compounds were detected.

Composite A was analyzed for total lead content; 265 ppm of lead was detected. While this concentration is slightly elevated compared to natural background levels, it is within the range commonly observed in urban areas. Sources of lead in urban soils include automobile exhaust and lead paint chips.



Composite A was also submitted for TCLP analysis for metals, pesticides and herbicides. The metals results indicated a barium concentration of 0.430 ppm, and a lead concentration of 0.230 ppm in the sample leachate; these concentrations are below applicable standards for these metals. None of the remaining six metals analyzed were detected, and no pesticides or herbicides were reported.

GZA's laboratory analyzed Composite A for PCBs by EPA Method 8080; none were detected.

Groundwater

No VOCs were detected in GZA's GC screening of the six groundwater samples collected from Parcel A in June 1991, with the exception of five unknown compounds in the sample from GZA-4 (Table 5). This sample was submitted for TPH-IR analysis; the TPH level was below the detection limit for the technique employed (1 ppm).

No VOCs were detected in four of the seven groundwater samples collected in March 1992. Four unknown VOCs were reported in sample GZA-4. Six unknown VOCs and 36 parts per billion (ppb) of toluene were detected in sample GZA-11, and a trace of m,p-xylenes and 22 unknown compounds were detected in sample GZA-13. Toluene and xylenes are common constituents of petroleum products, such as gasoline and diesel fuel. Unknown compounds reported in these samples may also be petroleum-related hydrocarbons.

PHC analysis of samples GZA-2, GZA-4 and GZA-13 did not indicate the presence of PHCs in any of the samples above the 0.5 ppm method detection limit.

Samples GZA-4, GZA-11 and GZA-13 were screened for semi-VOCs; none were detected with the exception of the PAH compounds benzo-a-anthracene and chrysene in GZA-11; both were present at concentrations below the minimum quantification level (BMQL) of the screening procedure (0.005 ppm).

The pH of the groundwater samples ranged from 6.6 to 8.8. The higher pH readings may be associated with concrete in the fill material. Specific conductance ranged from 596 to 5,540 μ mhos/cm. These readings are elevated for New England groundwater but are within the ranges commonly observed at urban sites. Elevated conductance may be related to the impact of residual amounts of brackish water due to the marine origin of site sediments.

7.32 Parcel B

A total of 92 soil samples and nine groundwater samples (four from the June 1991 sampling round and five from the February/March 1992 sampling round) were collected from Parcel B.

Soils

PID screening did not indicate detectable levels of VOCs in 59 of the 92 soil samples (Table 5) from Parcel B. PID readings of approximately 2 ppm or less were reported in 27 of the 33 samples in which VOCs were detected; GZA considers these levels to be within the background range typically observed in an urban area. Readings between 6.8 and 65 ppm were detected in soil samples GZB-1, S-2 and S-3; GZB-3, S-2; GZB-5, S-5 and S-6; and GZB-6, S-3. With the exception of the samples from GZB-5, all of the elevated VOC readings were observed in samples from the fill.

Based on the PID readings, 10 soil samples were selected for GC screening. With the exception of the samples from GZB-3, none of the 23 common VOCs identified by GZA's GC screening technique were identified in the samples. Trace levels of toluene, ethyl benzene and xylenes (compounds often associated with petroleum products) were detected in GZB-3, S-1 and S-2. Unknown VOCs were reported in all of the samples except GZB-4, S-5. Trace to moderate levels of late eluting compounds were detected in GZB-2, S-1; GZB-3, S-1; and GZB-5, S-5 and S-6. Trace to high levels of variously eluting compounds were detected in GZB-1, S-1, S-3 and S-4. The pattern of the chromatogram for GZB-6, S-3 indicates the presence of an unknown petroleum distillate such as fuel oil.

Based on the GC and PID screening results, 13 soil samples were submitted for TPH-IR analysis (Table 7). The results indicated TPH levels between 75 ppm and 1,500 ppm for soil samples GZB-1, S-2, S-3; GZB-2, S-1, GZB-3, S-1, S-2; GZB-5, S-6; and GZB-3, S-3; non-detectable levels of TPH were reported samples GZB-1, S-4; GZB-2, S-3; GZB-3, S-3 and S-18; GZB-4, S-5; and GZB-5, S-5. Four soil samples including two composite samples were analyzed for PHCs by GC methods; PHC concentrations ranged from 280 to 830 ppm. The PHC concentrations in the composites were lower than those measured in individual samples. Composite 2 consists of samples GZA-9, S-1 and GZA-10, S-1, while Composite B consists of the S-1 samples from borings GZA-9, GZA-10 and GZA-12. PHCs from the February 1992 soil samples were qualitatively identified as components of a product in the fuel oil No. 6/asphalt boiling range.

The samples submitted for PHC analysis were also screened by GZA for semi-volatile organic compounds. The screening indicated the presence of a number of PAHs at total concentrations ranging from 1.1 to 68 ppm. As noted previously,

PAHs are commonly found at similar concentrations in urban fill. No semi-volatile organic compounds other than PAHs were detected.

Results of analysis of Composite B for total lead indicated a lead concentration of 245 ppm; while slightly elevated above natural background levels, this concentration is not unusual for an urban area.

TCLP analysis of Composite B for metals did not indicate the presence of seven of the eight RCRA metals above the method detection limit. Barium was reported at a concentration of 0.46 ppm; this concentration is below the applicable standard for barium. No pesticides or herbicides were detected.

GZA's PCB screening of Composite B indicated the presence of 0.012 of PCB Aroclor 1260. This level is just above the method detection limit of 0.01 ppm.

Groundwater

The pH of the groundwater ranged from 6.6 to 8.1 (Table 7), which is within the normal range for groundwater in New England. The conductivity ranged between 561 and 3,120 μ mhos/cm, which is elevated high for New England groundwater. However, based on the urban setting and the marine origin of most of the sediments, the high conductivities may be due to residual salt water trapped within the sediment or road salting practices.

Identifiable VOCs were not reported in samples collected in June 1991 analyzed by headspace GC techniques. However, in a sample from well GZB-1, the results indicated trace to low levels of eight early and late eluting compounds. Based on the VOC screening results, a duplicate sample from GZB-1 was analyzed by TPH IR methods. The results revealed 18 ppm of PHCs.

Results of the February/March sampling round indicated the presence of trace concentrations of m,p-xylenes in sample GZB-1, as well as two unknown VOCs. A trace concentration of toluene, 39 ppb ethyl benzene, 275 ppb total xylenes and 40 unknown VOCs were detected in sample GZA-12.

Groundwater samples from wells GZB-1, GZB-5 and GZA-12 were screened for PHCs; none were reported above the 0.5 ppm detection limit. Samples from GZB-5 and GZA-12 were also screened for semi-VOCs; none were detected.

8.00 POTENTIAL MIGRATION PATHWAYS, EXPOSURE POINTS, AND RECEPTORS



As required under the MCP 310 CMR 40.00 (2)(b), GZA identified potential pathways of contaminant migration, exposure points, and human and environmental receptors of the contamination detected at the BRA Parcels A and B site in Boston Massachusetts. This discussion is based on information presented in this report and state and federal documents regarding environmentally sensitive receptors.

8.10 POTENTIAL MIGRATION PATHWAYS

Under current site conditions, the potential migration pathways for the detected contaminants include the leaching of soil contaminants (VOCs, PAHs, metals and PCBs) into groundwater and the migration of contaminated groundwater to Fort Point Channel approximately 2,000 feet downgradient of the site. Additionally, contaminated surficial soils may erode during the future construction planned for the property and wash into the storm sewer system, leading to eventual discharge into a downgradient surface water body.

The potential exists for the release of vapors and fugitive dust from contaminated soil and the volatilization of VOCs from the contaminated groundwater under the future construction scenario.

8.20 IDENTIFICATION OF EXPOSURE POINTS AND RECEPTORS

Environmentally sensitive areas as defined by the MCP include wetlands, areas subject to 100-year flooding and sensitive terrestrial and aquatic habitats. GZA has reviewed a number of state and Federal sources for information regarding the presence of such environmentally sensitive areas within the vicinity of the BRA Parcels A and B. These sources are listed below:

- U.S.G.S Topographic Map, Boston North Quadrangle (dated 1984);
- U.S. Fish and Wildlife Service, National Wetlands Inventory Map (NWI) (Boston North Quadrangle);
- Massachusetts Department of Environmental Protection, Division of Water Pollution Control (DWPC), Basin Classifications and Maps (310 CMR 4.06);
- U.S. EPA, Region I list of Priority Wetlands in New England (dated September, 1987);
- Massachusetts Natural Heritage Program (MNHP), Atlas of Estimate Habitats of State-listed Rare Wetlands Wildlife, 1992 Edition;

- July 1991 list of Areas of Critical Environmental Concern (from Department of Environmental Management, Division of Resource Conservation).

8.21 Potential Human Health Receptors

Given the current use of the property and the presence and potential for migration of contaminants described above, the likelihood of contact between potential human receptors (i.e. trespassers) and the contaminated soil and groundwater media is low due to the fact that the area is fenced.

Construction on the site may expose construction workers to contamination through direct contact with surficial and subsurface soils and groundwater, and inhalation of fugitive dust.

Several factors may serve to mitigate the potential for exposures to human receptors. Construction activities are planned to begin in approximately six months and are likely to result in additional fencing around the parcel and increased security, which will minimize the potential for trespassing activities and subsequent exposure to site media. In addition, construction activities are governed by OSHA regulations and standards, which include specific provisions to limit direct contact to contaminated soils and groundwater.

8.22 Potential Environmental Receptors

The current setting of the site is urban/residential in nature. The site lies approximately 2,000 feet upgradient of the Fort Point Channel, which is part of Boston Inner Harbor. Fort Point Channel is considered part of the Boston Harbor Drainage System. While this area has Class SB status under the Massachusetts Surface Water Quality Standards (314 CMR 4.00) and can therefore technically be used for primary contact recreation, the water has poor aesthetic quality and is not likely to be used for this purpose. The channel is also, under these standards, designated as habitat for shellfish, other fish, and wildlife. However, past pollutant input due to urbanization of the area and the resultant poor water quality are likely to have greatly reduced the diversity of aquatic life.

Boston Inner Harbor and its nearby tributaries have been impacted by the urban nature of their surroundings. The Inner Harbor has been described by the Massachusetts Division of Marine Fisheries as anoxic in most portions for the greater part of the year. Fish which may be found in the oxygenated portions of the Harbor include winter Flounder (Pseudopleuronectes americanus), Alewife (Alosa pseudoharagus), Smelt (Osmeridae) and River Herring (Clupeidae). Commercial fishing is not allowed in the Inner Harbor and recreational fishing is generally not a recognized activity due to low fish abundance and diversity. However, some recreational fishing does occur in this area.



Potential direct exposure pathways for plants and wildlife most commonly associated with contaminated sites include some or all of the following: exposure to contaminated groundwater upon discharge to a surface water body, exposure to contaminated surface water and sediments, uptake of contaminated groundwater by plant roots, and exposure to contaminated soils. As with humans, exposure may take the form of direct contact, inhalation and ingestion. However, potential effects data associated with many plant and wildlife exposure scenarios are often limited. The exposure pathways considered for this site include off-site exposure to contaminated groundwater discharging to Fort Point Channel.

The levels of VOC detected in the site groundwater were compared to the U.S. Ambient Water Quality Criteria for the protection of marine life and found to be below these values. For this reason, it does not appear that the site contamination will have any adverse effects on the primary exposure point, Fort Point Channel.

It is also well known that, in general, VOCs must be present in relatively high concentrations in surface water to elicit toxic effects (in aquatic biota). It is likely that the concentrations of VOCs in site groundwater will be further diluted and attenuated (due to biodegradation, adsorption, and volatilization) before and after the groundwater discharges to surface water.

9.00 SUMMARY AND CONCLUSIONS

A Phase I - Limited Site Investigation was conducted at the BRA Parcels A and B on Washington Street in Boston, Massachusetts. The study included a site reconnaissance; a review of the site history; a review of available local, state and federal regulatory records; subsurface explorations, and chemical analyses of soil and groundwater samples. On the basis of the work conducted as part of this study, we have reached the conclusions described below:

- The site is located near the Chinatown section of Boston, Massachusetts. Two schools, the Josiah Quincy School and the Don Bosco High School, are on the opposite side of Washington Street and within 500 feet of the site. The site is currently covered by an abandoned six-story building, paved and unpaved automobile parking areas, a playground, and the remnants of a vegetable garden. During our initial site reconnaissance, a few cans of spray paint, and automotive paint and an automobile garage bay were observed in the first floor of the site building. No evidence of the presence of hazardous material or oil were observed on the ground surface except for occasional isolated oil-like stains typically observed on automobile parking lots.
- Our historical review indicated that several small site buildings housed businesses such as a carpentry shop, a livery stable, a hotel, a stained glass



shop, a blacksmith shop, an armory, a furniture shop, a carpet shop, an appliance store, and an engraving shop. In addition, a substation, an elevated railway track, a playground, and a portion of a city street were also on the site.

- Our review of municipal agency files did not indicate a release of hazardous material or oil at the site. The site was indicated to be serviced by municipal water and sewer services. No private or public supply wells were identified to within 1/4 mile of the site.
- Review of DEP records did not indicate any reports of a release of hazardous material or oil at the site; however, several releases were indicated to have occurred within 1/4 mile of the site. Several businesses registered as RCRA hazardous waste generators were also indicated to be within 1/4 mile of the site. The DEP Water Supply Protection Atlas indicated that no public drinking water supply wells or reservoirs are within 1 mile of the site.
- Subsurface conditions consist of between 6 and 13.5 feet of granular fill overlying natural silts and clays. Four deep borings encountered glacial till at depths ranging from 71 to 87 feet below ground surface and bedrock at depths of approximately 75 to 94.5 feet below ground surface. Groundwater was encountered at depths of approximately 6 feet to 13 feet below ground surface. Results of our groundwater elevation survey indicate that groundwater flows to the southeast toward the Massachusetts Turnpike and the Fort Point Channel.
- Results of our chemical analyses of soil and groundwater samples generally indicated the presence of contaminants typically associated with urban sites. Chemical analyses of soil samples detected low levels of aromatic and petroleum-related VOCs, up to 5,400 ppm of PHCs, 1.1 to 82 ppm of PAHs, and 245 to 265 ppm of lead in soil samples from Parcels A and B. Chemical analyses results of groundwater samples detected low levels of aromatic VOCs and unknown compounds in five of 12 groundwater samples, a low level of PHCs in one of six groundwater samples, and levels below method quantification limits of two PAHs.

On the basis of the observations made and the information reviewed during the course of this Phase I - Limited Site Investigation as described above, it is GZA's opinion that the site is a "disposal site" as defined under the MCP. It is GZA's opinion that the site should be classified as a non-priority disposal site and that no Short-Term Measure is warranted due to the limited potential for exposure to site contaminants. Although two schools are located within 500 feet of observed contamination at the site, we do not believe the site poses an increased risk of exposure to children from the schools. In addition, it is also GZA's opinion that the site is eligible for a Waiver of Approvals for possible remediation of contaminated soils during the planned future development of the site.

While our testing results indicate the presence of hazardous materials in soils from the site, the limited analyses completed to date indicate that soils excavated during proposed construction would not be classified as hazardous wastes. Based on our recent discussions with DEP on similar projects, however, the fill material at the site will most likely be classified as a regulated soil requiring DEP approval for off-site disposal.



10.00 RECOMMENDATIONS

The presence of contaminated soils and groundwater at the site does not, in GZA's opinion, preclude development of the parcel. However, site planning and subsequent developments should proceed with caution to limit adverse environmental effects. Specifically, GZA recommends the following regarding site development.

1. A full asbestos survey should be conducted in the existing building on Parcel B prior to demolition of the structure. The survey should be conducted by a qualified asbestos removal contractor.
2. Given the nature of past users of the site, there is a potential for aboveground and underground storage tanks to exist at the site. Localized zones of soil contamination may also exist in areas where borings were not completed. Excavation during proposed site development should be closely monitored by a qualified geotechnical engineer with hazardous waste management experience.
3. The proposed development will leave the site covered with asphalt, landscaped areas and/or structure, thus limiting future human exposure to soils. During construction, however, there will be soil excavated for foundation construction and utility installation. The contractor should be informed of the environmental concerns at the site so that he can take appropriate health and safety precautions for his workers and occupants of surrounding sites including the nearby schools.
4. Soils excavated during construction should be disposed in accordance with relevant state and federal guidelines. Appropriate technical specifications should be developed by the geotechnical engineer with regard to this issue. As an alternative to stockpiling and testing during construction, the soil at the site could be characterized prior to construction. This, however, would involve additional exploration and chemical testing to better evaluate the extent and composition of potentially contaminated material. The required testing would have to satisfy both the DEP and facilities where the material will be disposed. Although this may involve more testing than the "test-as-we-go" approach, it will

reduce the amount of on-site stockpiling and time-consuming testing, which could impact on the construction schedule. Also, the DEP still recommends full-time monitoring during excavation operations to confirm that conditions are as expected based on the boring program.

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5. Dewatering may be required for construction activities at the site, and special provisions should be made for handling the pumped water. These may include procurement of environmental permits and/or monitoring of effluent water quality. GZA, therefore, suggests that the permitting process begin as soon as possible because of the long lead times involved with obtaining the necessary permits.

GZ

TABLES

TABLE 1
ACDC - PARCELS A AND B
RCRA GENERATORS IN BOSTON, MASSACHUSETTS
IN VICINITY OF 884-888 WASHINGTON STREET

Facility Name	Facility Address	RCRA Information ¹		FINDS ^{1, 3} Information
		Activity Type ²	Notification Date	
Banner Publications	925 Washington St.	2	03/07/88	
Beckler Press	1 Herald Sq.	2	11/08/83	•
Boston Herald	1 Herald Sq.	2	11/08/83	•
Commonwealth Cleaners	192 Harvard St.	2	11/20/86	
Eastover Transportation Co.	919 Washington St.			•
Hertz Penske Truck Leasing	1 Herald Sq.			•
New England Medical Center	750 Washington St.	1	07/24/81	•
New England Medical Center	171 Harrison Ave.	1	04/18/86	
New England Telephone Co. Motor Vehicle Dept.	170 Shawmut Ave.	2	04/18/86	
Rapid Service Press, Inc.	375 Broadway	2	08/01/80	•
Sasco Corp.	790 Washington St.	2	07/23/86	•
Tufts University Medical School	136 Harrison Ave.	1	12/03/80	•
U.S. Dept. Agriculture Human Nutr. Res.	711 Washington St.	2	04/08/83	•
U.S. Dept. Agriculture Human R.	711 Washington St.			•

Notes:

- Information compiled by GZA personnel from EPA RCRA list updated through March 3, 1992 and Facility Index System (FINDS) list updated through March 4, 1992.
- Activity types as follows:
1 = large quantity generator (>1,000 kg/month)
2 = small quantity generator (100-1,000 kg/month)
- All sites listed on FINDS list were included under Hazardous Waste Data Management System (HWDMS) - RCRA information. FINDS list does not specify generator status or notification date.

TABLE 2
GROUNDWATER ELEVATION MEASUREMENTS

Station	Wellhead Elevation	Depth to Groundwater	Relative Groundwater Elevation
GZA-1	99.0	9.0	90.0
GZA-2	100.2	9.8	90.4
GZA-4	---	12.64	---
GZA-5	98.00	9.8	88.2
GZA-10	98.3	7.1	91.2
GZA-11	96.6	7.6	89.0
GZA-12	99.1	6.9	92.2
GZA-13	98.5	11.8	86.7
GZB-1	99.7	8.3	91.4
GZB-4	99.2	6.3	92.9

Notes:

1. Wellhead elevations surveyed in feet from top of road box relative to arbitrary benchmark elevation of 100 feet located on the bolt on the base of the fire hydrant at the corner of Pine and Washington Streets. Survey conducted by GZA on March 1991.
2. Depths to groundwater measured in feet from top of road box by GZA on March 3, 1992.
3. Relative groundwater elevations (in feet) = wellhead elevation minus depth to groundwater.

TABLE 3
PHOTOIONIZATION DETECTOR RESULTS
(VOLATILE ORGANIC COMPOUND SCREENING/PPM)

BRA - Parcel A

Sample No.	Boring Location											
	GZA-1	GZA-2	GZA-3	GZA-4	GZA-5	GZA-6	GZA-7	GZA-8	GZA-11	GZA-12		
S-1	ND	ND	ND	3.7	Neg.	Neg.	ND	1.8	1.3	ND		
S-2	ND	0.7	ND	6.0	Neg.	Neg.	0.6	ND	ND	ND		
S-3	ND	0.9	ND	Neg.	8.2	Neg.	0.6	ND	ND	ND		
S-4	ND	ND	ND	Neg.	Neg.	Neg.	ND	ND	ND	ND		
S-4A	--	--	--	--	--	--	--	ND	--	--		
S-5	ND	2.8	ND	Neg.	Neg.	Neg.	0.8	ND	--	--		
S-6	ND	ND	Neg.	Neg.	Neg.	Neg.	ND	ND	--	--		
S-7	ND	ND	Neg.	Neg.	Neg.	ND	ND	ND	--	--		
S-8	--	ND	Neg.	Neg.	--	--	--	--	--	--		
S-9	--	ND	ND	Neg.	--	--	--	--	--	--		
S-9A	--	--	--	Neg.	--	--	--	--	--	--		
S-10	--	ND	--	Neg.	--	--	--	--	--	--		
S-11	--	ND	--	Neg.	--	--	--	--	--	--		
S-12	--	ND	--	Neg.	--	--	--	--	--	--		
S-13	--	0.1	--	Neg.	--	-	--	--	--	--		

TABLE 3 (CONT'D)

Boring Location										
Sample No.	GZA-1	GZA-2	GZA-3	GZA-4	GZA-5	GZA-6	GZA-7	GZA-8	GZA-11	GZA-12
S-14	--	--	--	Neg.	--	--	--	--	--	--
S-15	--	--	--	Neg.	--	--	--	--	--	--
S-16	--	ND	--	Neg.	--	--	--	--	--	--

Notes:

1. ND denotes non-detected; -- denotes no sample taken or no recovery for the sample number at that boring location.
2. Results are in parts per million and represent total organic vapor levels referenced to a benzene standard. Results obtained by laboratory analysis of the headspace soil sample jars using an H-Nu PI-101 photoionization detector (PID).

TABLE 4

[illegible]

TABLE 4 (CONT'D)

Notes:

- 1 ND = nothing detected. Blank spaces indicate analyses not performed on sample. See Appendix D for laboratory data sheets.
2. Analysis performed using a Hewlett Packard Model 5890A gas chromatograph at GZA's ECL. Naturally occurring methane detected in some samples. "() unknowns" indicates that unknown compounds were detected but could not be identified or quantified. Number in parenthesis indicates number of unknown compounds detected.
3. Analysis performed by EPA Method 418.1 at GZA's ECL.
4. Analysis performed by PHC Fingerprint technique at GZA's ECL.
5. Polynuclear aromatic hydrocarbons (PAH) analyses performed by EPA Method 8100 at GZA's ECL.
6. Total lead analysis performed by EPA Method 7421 at Matrix Analytical Laboratory of Hopkinton, Massachusetts.
7. Flashpoint analysis performed by Method 1010 at Matrix Analytical Laboratory.
8. Toxic Classification Leachate Procedure (TCLP) RCRA eight metals analysis performed at Matrix Analytical Laboratory. See laboratory data sheets for EPA methods.
9. Pesticides analysis performed by EPA Method 8080 and herbicide analysis performed by EPA Method 8150 at Matrix Analytical Laboratory.
10. Polychlorinated biphenyls (PCB), analyses performed by EPA Method 8080 at GZA's ECL.
11. Composite sample A is composed of GZA-13/S-1 and S-2 and GZA-11/S-1, S-2 and S-3; composite sample A was analyzed for PHCs, PAHs at GZA's ECL and for remaining analyses at Matrix Analytical.
12. Sample analyzed by Matrix Analytical for total lead, flashpoint, TCLP RCRA metals, pesticides/herbicides and PCBs.
13. Composite sample 1 is composed of GZA-13/S-1 and S-2, and analyzed in GZA's ECL.

TABLE 5
RESULTS OF CHEMICAL ANALYSES OF WATER SAMPLES¹
PARCEL A - WASHINGTON STREET, BOSTON, MASSACHUSETTS

Sample	VOC-GC ² (ppm)		TPH-1R ³ (ppm)	PHC-FID ⁴ (ppm)	PAH ⁵ (ppm)	pH ⁶	Specific Conductance ⁷ (μ s/cm)
	1991	1992					
GZA-1	ND	ND				8.8	596
GZA-2	ND	ND		<.5			
GZA-4	ND (5) unknowns	ND (4) unknowns	<1	<.5	ND	7.9	5,540
GZA-5	ND	ND				6.6	2,780
GZA-8	ND	ND				7.1	1,060
GZA-11		.036 toluene (6) Unknowns			BMQL for benzo-A- anthracene and chrysene	7.0	1,990
GZA-13		Trace m,p-xylenes (22) unknowns		<.5	ND	7.1	2,360

Notes:

1. ND = nothing detected. Blank spaces indicates analyses not performed on sample. BMQL = below minimum quantitation limit. See Appendix E for laboratory data sheets.
2. Analysis performed using a Hewlett Packard Model 5890A gas chromatograph at GZA's ECL. Naturally occurring methane detected in some samples. "() Unknowns" indicates that unknown compounds were detected but could not be identified or quantified. Number in parenthesis indicates number of unknown compounds detected. Samples GZA 1, 2, 4, 5 and 8 were sampled and analyzed in the summer of 1991 and again in March 1992.

TABLE 5 (CONT'D)

3. Analyses performed by EPA Method 418.1 at GZA's ECL.
4. Analysis performed by PHC Fingerprint technique at GZA's ECL.
5. Polynuclear aromatic hydrocarbon (PAH) screening for semi-VOCs performed by EPA Method 8100 at GZA's ECL.
6. Analysis performed using an Orion Model EA 940 Expandable Ionanalyzer at GZA's ECL.
7. Analysis performed using YSI Model 34 Conductance - Resistance meter at GZA's ECL.

TABLE 6
ACDC - PARCEL B
PHOTOIONIZATION DETECTOR RESULTS
(Volatile Organic Compound Screening/ppm)

Boring Location									
Sample No.	GZB-1	GZB-2	GZB-3	GZB-4	GZB-5	GZB-6	GZA-9	GZA-10	GZA-13
1	ND	1.0	2.2	ND	ND	ND	1.1	0.7	0.5
2	14.8	ND	6.8	ND	0.5	ND	0.1	ND	0.6
2A	--	--	--	--	--	ND	--	--	--
3	65	0.8	0.5	ND	1.2	22	0.7	ND	0.3
3A	--	ND	--	--	--	1.2	--	--	--
4	2.2	ND	--	ND	ND	0.3	1.1	ND	ND
4A	--	--	--	--	ND	--	--	--	--
5	ND	ND	ND	1.7	30	ND	--	--	--
5A	--	--	-	--	1.2	--	--	--	--
6	ND	ND	--	ND	27	0.6	--	--	--
6A	--	--	--	--	ND	0.2	--	--	--
7	ND	ND	ND	ND	0.8	0.2	--	--	--
7A	--	--	--	--	0.2	--	--	--	--
8	ND	ND	0.2	ND	ND	ND	--	--	--
8A	--	--	--	--	ND	--	--	--	--
9	ND	ND	ND	ND	ND	ND	--	--	--
9A	--	--	ND	--	--	ND	--	--	--
10	ND	--	ND	ND	--	--	--	--	--
10A	--	--	ND	--	--	--	--	--	--
11	ND	--	ND	--	--	--	--	--	--
12	ND	--	ND	--	--	--	--	--	--
13	ND	--	ND	--	--	--	--	--	--
14	ND	--	ND	--	--	--	--	--	--

TABLE 6 (CONT'D)

Boring Location									
Sample No.	GZB-1	GZB-2	GZB-3	GZB-4	GZB-5	GZB-6	GZA-9	GZA-10	GZA-13
15	ND	--	ND	--	--	--	--	--	--
16	--	--	0.3	--	--	--	--	--	--
17	--	--	ND	--	--	--	--	--	--
18	--	--	1.4	--	--	--	--	--	--

Notes:

1. ND denotes non-detected; -- denotes no sample taken or no recovery for the sample number at that boring location.
2. Results are in parts per million and represent total organic vapor levels referenced to a benzene standard. Results obtained by laboratory analysis of the headspace soil sample jars using an H-Nu PI-101 photoionization detector (PID).

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES PARCEL B - WASHINGTON STREET, BOSTON, MASSACHUSETTS

[illegible]

TABLE 7 (CONT'D)

Notes:

1. ND = nothing detected. Blank spaces indicate analyses not performed on sample. See Appendix D for laboratory data sheets.
2. Analysis performed using a Hewlett Packard Model 5890A gas chromatograph at GZA's ECL. Naturally occurring methane detected in some samples. "() unknowns" indicates that unknown compounds were detected but could not be identified or quantified. Number in parenthesis indicates number of unknown compounds detected.
3. Analysis performed by EPA Method 418.1 at GZA's ECL.
4. Analysis performed by PHC Fingerprint technique at GZA's ECL.
5. Polynuclear aromatic hydrocarbons (PAH) analyses performed by EPA Method 8100 at GZA's ECL.
6. Total lead analysis performed by EPA Method 7421 at Matrix Analytical Laboratory of Hopkinton, Massachusetts.
7. Flashpoint analysis performed by Method 1010 at Matrix Analytical Laboratory.
8. Toxic Classification Leachate Procedure (TCLP) RCRA eight metals analysis performed at Analytical Laboratory. See laboratory data sheets for EPA methods.
9. Pesticides analysis performed by EPA Method 8080 and herbicide analysis performed by EPA Method 8150 at Matrix Analytical Laboratory.
10. Polychlorinated biphenyls (PCB), analyses performed by EPA Method 8080 at GZA's ECL.
11. Composite Sample B is composed of GZA-9/S-1, GZA-10/S-1 and GZA-12/S-1; Composite B sample was analyzed for P11Cs and PAHs at GZA's ECL, and for remaining analyses at Matrix Analytical.
12. Composite Sample 2 is composed of GZA-9/S-1 and GZA-10/S-1; Composite 2 sample was analyzed at GZA's ECL.
13. Composite by sample was analyzed at Matrix Analytical.

TABLE 8
RESULTS OF CHEMICAL ANALYSES OF WATER SAMPLES¹
PARCEL B - WASHINGTON STREET, BOSTON, MASSACHUSETTS

Sample	VOC-GC ² (ppm)		TPH-IR ³ (ppm)	PHC-FID ⁴ (ppm)	PAH ⁵ (ppm)	pH ⁶	Specific Conductance ($\mu\text{S}/\text{cm}$) ⁷
	1991	1992					
GZB-1	ND (8) unknowns	Trace m,p-xylenes ¹ (2) unknowns	18	<.5		7.8	1,200
GZB-4	ND	ND ²				7.3	561
GZB-5	ND	ND		<.5	ND	7.2	1,920
GZA-10		ND				8.1	3,110
GZA-12		Trace toluene .039 ethyl benzene .180 m,p-xylenes .095 o-xylenes 310 Total VOCs (40) unknowns		<.5	ND	6.6	1,440

Notes:

1. ND = nothing detected. Blank spaces indicates analyses not performed on sample. BMQL = below minimum quantitation limit. See Appendix E for laboratory data sheets.
2. Analysis performed using a Hewlett Packard Model 5890A gas chromatograph at GZA's ECL. Naturally occurring methane detected in some samples. "() Unknowns" indicates that unknown compounds were detected but could not be identified or quantified. Number in parenthesis indicates number of unknown compounds detected.

TABLE 8 (CONT'D)

3. Analyses performed by EPA Method 418.1 at GZA's ECL.
4. Analysis performed by PHC Fingerprint technique at GZA's ECL.
5. Polynuclear aromatic hydrocarbon (PAH) screening for semi-VOCs performed by EPA Method 8100 at GZA's ECL.
6. Analysis performed using an Orion Model EA 940 Expandable Ionanalyzer at GZA's ECL.
7. Analysis performed using YSI Model 34 Conductance - Resistance meter at GZA's ECL.



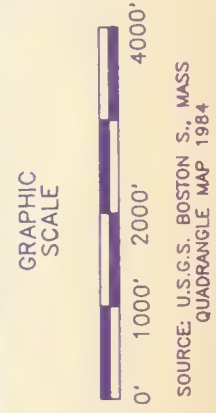
FIGURES



DRAWN BY: RWB
SCALE: 1: 25000
DATE: MAR , 1992

DESIGNED BY: JB
CHECKED BY: JB
REVIEWED BY: JB

GZA GeoEnvironmental, Inc.

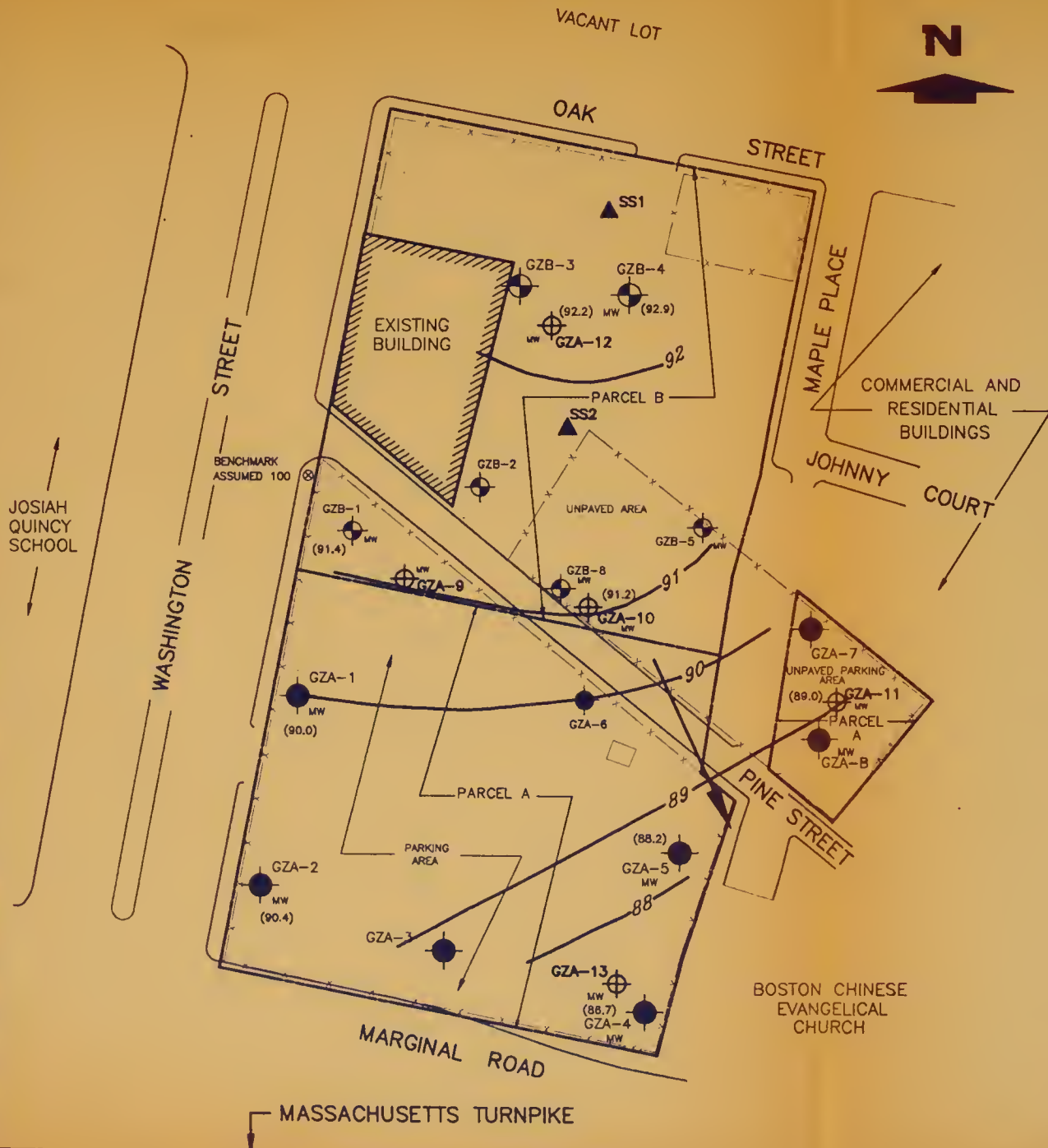


CHINESE ECONOMIC
DEVELOPMENT CORPORATION PARCEL - A
CHINATOWN/BOSTON, MASS

LOCUS PLAN

PROJECT NO.
12854

FIGURE No.
1



NOTES:

- 1) SEE FIGURE 2 FOR ADDITIONAL NOTES AND LEGEND.
- 2) GROUNDWATER CONTOUR ARE BASED ON DATA TAKEN ON MARCH 3, 1992 FROM WIDELY SPACED EXPLORATIONS AND MAY NOT REFLECT ACTUAL SUBSURFACE CONDITIONS.
- 3) WATER LEVELS READINGS HAVE BEEN MADE IN THE DRILL HOLES AT THE TIMES AND UNDER THE CONDITIONS STATED ON THE LOGS. THESE DATA HAVE BEEN REVIEWED AND INTERPERTATIONS MADE IN THE TEXT OF THIS REPORT. HOWEVER, FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO VARIATIONS IN RAINFALL, TIDES, TEMPERATURES AND OTHER FACTORS SINCE THE TIME MEASUREMENTS WERE MADE.

LEGEND:



BORINGS PERFORMED BY GZA DRILLING ON FEBRURARY 24, 1992.

GROUNDWATER ELEVATIONS MEASURED ON MARCH 3, 1992.

GROUNDWATER ELEVATION CONTOUR

INFERRED GROUNDWATER FLOW DIRECTION

*THE OWNER SHALL BE PERMITTED TO RETAIN COPIES OF DRAWINGS AND SPECIFICATIONS PREPARED IN CADD FORM FOR THE OWNER'S INFORMATION IN ITS USE OF THE PROJECT DUE TO THE POTENTIAL THAT THIS INFORMATION CAN BE MODIFIED UNINTENTIONALLY OR OTHERWISE. GZA GEOENVIRONMENTAL INC. RESERVES THE RIGHT TO REMOVE ALL INDICATION OF ITS OWNERSHIP AND/OR INVOLVEMENT FROM EACH ELECTRONIC DISK OR TAPE.

ANY USE WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY GZA GEOENVIRONMENTAL INC. FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT OWNER'S SOLE RISK AND WITHOUT LIABILITY OR LEGAL EXPOSURE TO GZA GEOENVIRONMENTAL INC. AND OWNER SHALL INDEMNIFY AND HOLD HARMLESS GZA GEOENVIRONMENTAL INC. FROM ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM.

PARCELS A & B CHINATOWN/BOSTON, MASS.		REV. No.		DESCRIPTION		BY	DATE
				SCALE IN FEET		JB	
				PROJ. MGR.		JB	
				CHECKED BY:		JB	
				REVIEWED BY:			
				0' 25' 50' 100'			
GROUNDWATER CONTOUR PLAN							
PROJECT No.							
12854							
FIGURE No.							
3							
				GZA GeoEnvironmental, Inc.			



NOTES:

1. BASE MAP DEVELOPED FROM PLANS PROVIDED BY THE BSC GROUP-BEDFORD INC. ENTITLED "SITE PLAN OF LAND IN BOSTON, MASS.," DATED JUNE 30, 1989. ORIGINAL SCALE 1"=16', DRAWING NO. 1601.03.
2. THE LOCATION OF THE BORINGS WERE APPROXIMATELY DETERMINED BY TAPE MEASUREMENTS, LINE OF SITE AND PACING FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

- GZB-5 BORINGS PERFORMED BY GZA DRILLING BETWEEN JUNE 19 AND 29, 1991.
- GZA-5 BORINGS PERFORMED BY GZA DRILLING BETWEEN JUNE 19 AND 29, 1991.
- INDICATES MONITORING WELL WAS INSTALLED
- GZA-9 BORINGS PERFORMED BY GZA DRILLING ON FEBRUARY 24, 1992.
- SS-1 SURFACE SOIL SAMPLES COLLECTED BY GZA ON MARCH 23, 1992.
- X - X - CHAINLINK FENCE

DESCRIPTION		DATE
PROJ. MGR.	JB	DRAWN BY: RWB
CHECKED BY:	JB	SCALE: 1"=50'
REV. No.		DATE: MAR., 1992
SCALE IN FEET		
0' 25' 50' 100'		
PARCELS A & B CHINATOWN/BOSTON, MASS.		
EXPLORATION LOCATION PLAN		
PROJECT No. 12854		
FIGURE No. 2		

"THE OWNER SHALL BE PERMITTED TO RETAIN COPIES OF DRAWINGS AND SPECIFICATIONS PREPARED IN CAD FOR THE OWNER'S INFORMATION IN ITS USE OF THE PROJECT. DUE TO THE POTENTIAL THAT THIS INFORMATION CAN BE MODIFIED UNINTENTIONALLY OR OTHERWISE, GZA GEOENVIRONMENTAL INC. RESERVES THE RIGHT TO REMOVE ALL INDICATION OF ITS OWNERSHIP AND/OR INVOLVEMENT FROM EACH ELECTRONIC DISK OR TAPE. ANY USE WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY GZA GEOENVIRONMENTAL INC. FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT OWNER'S SOLE RISK AND WITHOUT LIABILITY OR LEGAL EXPOSURE TO GZA GEOENVIRONMENTAL INC. AND OWNER SHALL INDEMNIFY AND HOLD HARMLESS GZA GEOENVIRONMENTAL INC. FROM ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM."

PHOTOGRAPHS

PHOTOGRAPHS

ASIAN COMMUNITY DEVELOPMENT CORPORATION
PARCEL B



Photograph 1
Date: June 26, 1991

View from the south looking north at the 884-888 Washington Street building; New England Medical Center and Tufts University Medical School buildings are shown in the background.



Photograph 2
Date: June 26, 1991

View from the west side of Washington Street looking northeast toward the 884-888 Washington Street building; note the garage door at the southwest corner of the building (right, center).



Photograph 3
Date: June 26, 1991

View from the unpaved parking lot of Parcel B looking west toward the 884-888 Washington Street building.



Photograph 4
Date: June 26, 1991

View from the north section of the grassed area of the site looking west toward the community garden.



Photograph 5
Date: June 26, 1991

View from the west side of Pine Street looking east along Pine Street toward Harrison Avenue; Parcel B parking area (left, center) and Parcel A parking area (right side, foreground); single family dwellings are located east of the parking lot (left, background), and the Boston Chinese Evangelical Church is located southeast of the Parcel B parking are (right, background).



Photograph 6
Date: June 26, 1991

View near the entrance to the Parcel B parking area looking west; note former foundation/building wall (center).

GA

APPENDIX A
LIMITATIONS

SITE ASSESSMENT LIMITATIONS

1. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by Client. The work described in this report was carried out in accordance with the attached Statement of Terms and Conditions.
2. In preparing this report, GZA GeoEnvironmental, Inc. (GZA) has relied on certain information provided by state and local officials and other parties referenced therein, and on information contained in the files of state and/or local agencies available to GZA at the time of the site assessment. Although there may have been some degree of overlap in the information provided by these various sources, GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this site assessment.
3. In the event that bank counsel or title examiner for Client obtains information on environmental or hazardous waste issues at the site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.
4. Observations were made of the site and of structures on the site as indicated within the report. Where access to portions of the site or to structures on the site was unavailable or limited, GZA renders no opinion as to the presence of hazardous material or oil, or to the presence of indirect evidence relating to hazardous material or oil, in that portion of the site or structure. In addition, GZA renders no opinion as to the presence of hazardous material or oil, or to the presence of indirect evidence relating to hazardous material or oil, where direct observation of the interior walls, floor, or ceiling of a structure on a site was obstructed by objects or coverings on or over these surfaces.
5. Unless otherwise specified in the report, GZA did not perform testing or analyses to determine the presence or concentration of asbestos or polychlorinated biphenyls (PCB's) at the site or in the environment at the site.
6. The purpose of this report was to assess the physical characteristics of the subject site with respect to the presence in the environment of hazardous material or oil, as defined in Massachusetts General Laws Chapter 21E. No specific attempt was made to check on the compliance of present or past owners or operators of the site with federal, state, or local laws and regulations, environmental or otherwise.
7. The conclusions and recommendations contained in this report are based in part upon the data obtained from a limited number of soil and/or groundwater samples obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.
8. Water level readings have been made in the test pits, borings, and/or observation wells at the times and under the conditions stated on the test pit or boring logs. However, it must be noted that fluctuations in the level of groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

9. Except as noted within the text of the report, no quantitative laboratory testing was performed as part of the site assessment. Where such analyses have been conducted by an outside laboratory, GZA has relied upon the data provided, and has not conducted an independent evaluation of the reliability of these data.
10. The conclusions and recommendations contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the report. As indicated within the report, some of these data are preliminary "screening" level data, and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA and the conclusions and recommendations presented herein modified accordingly.
11. Chemical analyses have been performed for specific parameters during the course of this site assessment, as described in the text. However, it should be noted that additional chemical constituents not searched for during the current study may be present in soil and/or groundwater at the site.
12. It is recommended that GZA be retained to provide further engineering services during construction and/or implementation of any remedial measures recommended in this report. This is to allow GZA to observe compliance with the concepts and recommendations contained herein, and to allow the development of design changes in the event that subsurface conditions differ from those anticipated.

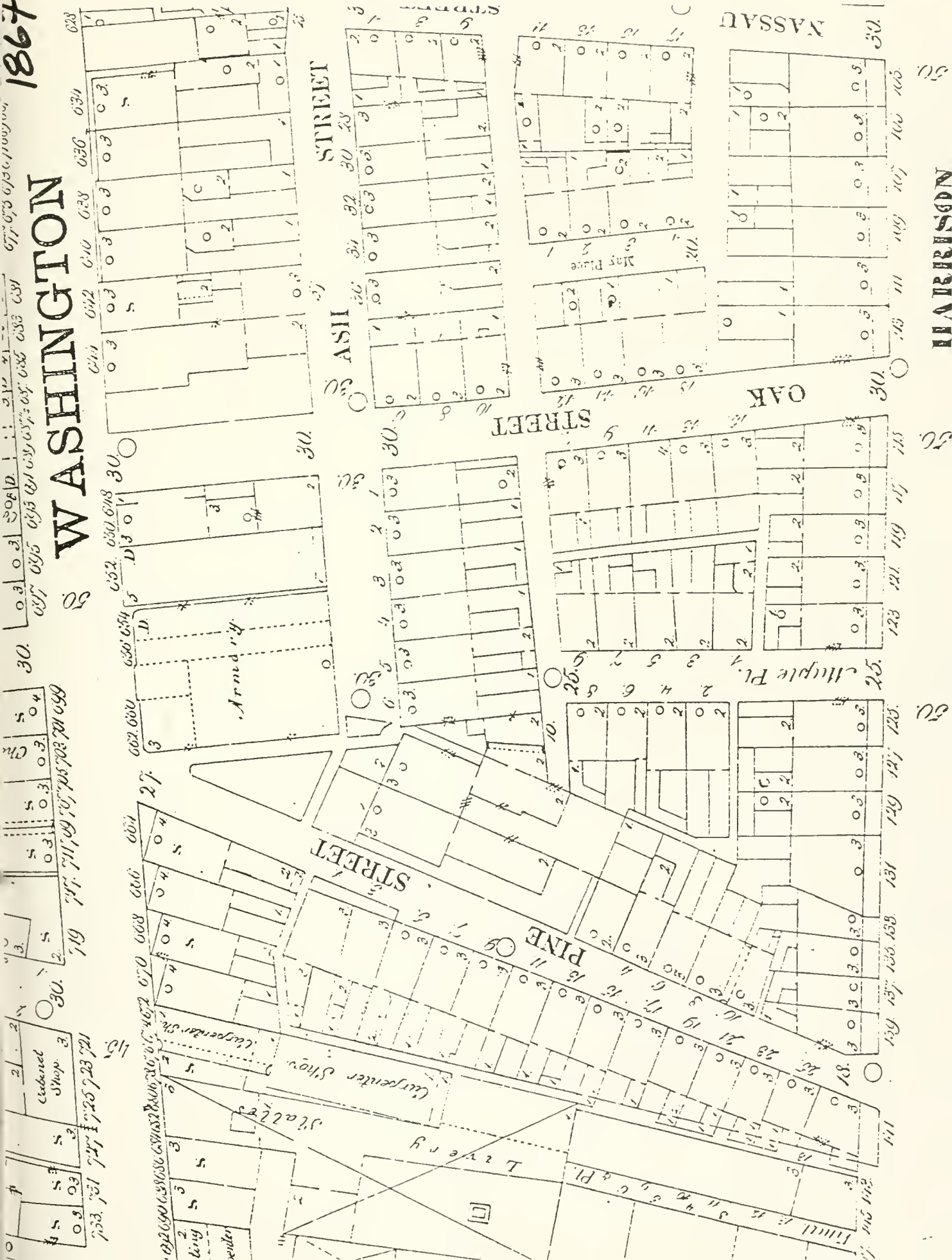


APPENDIX B
HISTORICAL ATLASES



1867

WASHINGTON



1867

WASHINGTON





ance Districts Nos 21, 22 & 26, as shown.

55
~~1894~~ 1895

53

WARRENTON ST.

PLEASANT ST.

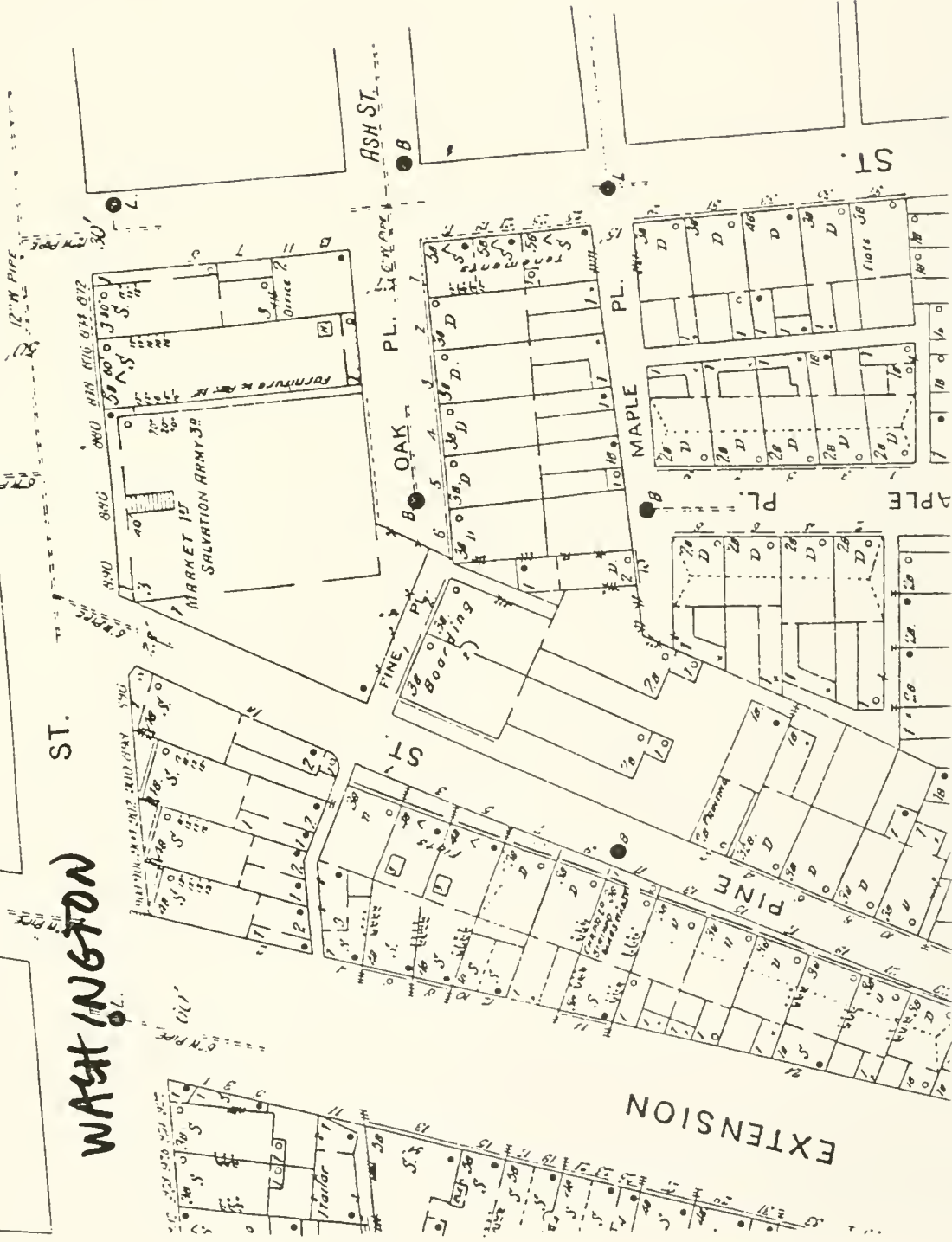
ST.

WASHINGTON

ASH ST.

ST.

EXTENSION





1929

58

WASHINGTON ST

WASHINGTON ST.



64

1951 (55)

58

WARREN ST

WASHINGTON ST.

ELEVATED RAILWAY TRACKS

ASH ST

PINE

PARK

RUSSELL HOTEL

OAK

MAP E







APPENDIX C
BORING LOGS

ZA GeoEnvironmental, Inc.
Engineers/Scientists
20 Needham Street
Newton Upper Falls, Massachusetts 02164
617) 969-0050

ACDC - Parcel B

Chinatown/Boston, Massachusetts

Boring No. GZB-1

Page 1 of 4

File No. 12535

Chkd. By: FMG

Drilling Co. GZA Drilling, Inc.

Operator C. Linling/P. Brown

Supervisor M.A. Ponti/ck

Start Date 6/15/91 End 6/19/91

Location See Exploration Location Plan

Elev. Datum

Type

I.D./O.D.

Hammer Wt.

Hammer Fall

Other 3-3/4" HSA; 3" Denison Tube; NX Split Barrel

Casing

HW/NW

4"/3"

300#

24"

Sampler

Split Spoon

2"

140#

30"

Groundwater Readings

Date

6/15/91

Time

1300

Depth

12'

Casing

20'

Stab. Time

0 Hrs.

C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
	No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	H-Nu Test Data					
	S-1	24/16	0-2	7-5	ND	Medium dense, dark brown, fine to coarse SAND, some(+) Silt, little(+) Gravel (Bricks, FILL).	2" ASPHALT	1.		Curb Box
				9-13				2.		Concrete 0-0.5'
										Backfill Sand 0.5-7'
5	S-2	24/20	5-7	6-6	14.8	Medium dense, dark brown, fine to coarse SAND, some(+) Silt, little(+) Gravel, trace(+) Clay (Bricks, FILL).	GRANULAR FILL			1.5" PVC Riser 0-10'
				5-7						Bentonite Seal 7-8'
										Filter Sand 8-20'
10	S-3	24/12	10-12	18-9	65	Medium dense, dark brown, fine to coarse SAND, some(+) Silt, little(+) Gravel (Brick, Wood, FILL).	± 12.5'	3.		1.5" PVC Wellscreen 10-20'
				8-6						
	S-4	24/16	13-15	10-10	2.2	Very stiff, olive brown, Silty CLAY (moist, highly plastic).	OLIVE BROWN SILTY CLAY			
				12-14			± 17.5'			Backfill Material 20-107.2'
15										
	S-5	24/21	18-20	6-7	ND	Stiff, gray, Silty CLAY (moist, highly plastic).				
				6-6						
20										
	S-6	24/19	23-25	4-5	ND	Stiff, gray, Silty CLAY, (moist, highly plastic).	GRAY SILTY CLAY			
				5-5						
25										
	S-7	24/19	28-30	3-4	ND	Stiff, gray, Silty CLAY, (moist, highly plastic).				
				4-4						

1. H-Nu readings represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using an H-Nu Model PI-101 photoionization analyzer. Results in parts per million (ppm). ND indicates nothing detected. Testing performed at GZA's Newton laboratory.
2. Locking curb box installed with concrete seal at ground surface.
3. Slight petroleum odor from sample S-3.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-1

4. Roller bit through rock between 94.5 and 97.3 feet.
5. NX split barrel sampler used to core rock; for rock coring, the number in the blows/6" column is minutes per foot of coring.

ratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-1

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

ACDC - Parcel B

Chinatown/Boston, Massachusetts

Boring No. GZB-2

Page 1 of 2

File No. 12535

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Operator C. Linling/Peter Brown

GZA Rep. M.A. Pontic/ck

Start Date 6/13/91 End 6/13/91

Location See Exploration Location Plan

S.Elev. Datum Other 3-3/4" HSA

Casing

Sampler

Groundwater Readings

Type

HW/NW

Split Spoon

Date

Time

Depth

Casing

Stab. Time

I.D./O.D.

4"/3"

2"

6/13/91

1201

10.8'

20

0 Hrs.

Hammer Wt.

300#

140#

Hammer Fall

24"

30"

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-1	24/17	0-2	5-13	1.0	Medium dense, black, fine to coarse SAND, some(+) Gravel, some(-) Silt (Brick, Glass, FILL).				NO EQUIPMENT INSTALLED
					6-12						
5		S-2	24/19	5-7	8.3	ND	Medium stiff, olive brown, SILT and CLAY (moist, FILL).				
					3-4						
10		S-3	24/20	10-12	5-8	0.8	Medium dense, olive gray, fine to coarse SAND and Clayey SILT (moist FILL).	11' ±			Backfill Material 0-42'
		S-3A			12-6	ND	3A: Olive brown, Silty CLAY (moist, highly plastic).				
		S-4	24/23	13-15	6-8	ND	Very stiff, Olive brown, Silty CLAY (moist, highly plastic).				
					8-8						
15											
20		S-5	24/24	20-22	5-6	ND	Stiff, gray, Silty CLAY (moist, very highly plastic).				
					7-7						
25		S-6	24/24	25-27	4-5	ND	Stiff, gray, Silty CLAY (moist, very highly plastic).				
					7-7						

Remarks 1. See Remark No. 1 on Boring Log No. GZB-1.

2. See Remark No. 2 on Boring Log No. GZB-1.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-2

Boring No. GZB-2

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

ACDC - Parcel B

Chinatown/Boston, Massachusetts

Boring No. GZB-3

Page 1 of 3

File No. 12535

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Foreman C. Linling

GZA Rep. C. Marshall/ck

Date Start 6/07/91 End 6/13/91

Location See Exploration Location Plan

GS.Elev. Datum

Casing

Sampler

Groundwater Readings

Type

HW/NW

Split Spoon

Date

Time

Depth

Casing

Stab. Time

I.D./O.D.

4"/3"

1-3/8"

6/7/91

1300

NA

10

0

Hammer Wt.

300#

140#

Hammer Fall

24"

30"

Other

3-3/4 HSA NX Split Barrel

D P T H	C B S L N W G S	Sample Information				
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data

Sample Description & Classification
--

Stratum Description

R M K S	Equipment Installed
------------------	---------------------

		S-1	24/14	0-2	9-11	2.2	Medium dense, black, fine to coarse SAND, some(-) Silt (brick, FILL).		1.		
					9-12				2.		NO EQUIPMENT INSTALLED
5		S-2	24/17	5-7	10-17	6.8	Dense, brown-black, fine to coarse SAND, some(-) Silt, little(-) Gravel.				
					14-12						
10		S-3	24/3	10-12	1-1	0.5	Moist, very loose, olive-brown, fine to coarse SAND, some(+) Silt and Clay.		3.		Backfill Material 0-100'
					1-2				4.		
15		S-4	0/0	15-17	100/0"		No Recovery.	17'			
		S-5	24/20	17-19	11-12	ND	Very stiff, olive-brown, CLAY, little(-) Silt (plastic). Pp = 1.7 tsf, Tv = 0.8 tsf				
					10-9						
20		S-6	0/0	21-23	30/0		Pulled HSA and dropped 4" HW casing to 20.5'. No Sample Recovery.	23' ±	5.		
25											
		S-7	24/24	28.5-30.5	2-3	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).				
					5-5						

Remarks
1. See Remark No. 1 on Boring Log No. GZB-1. 2. See Remark No. 2 on Boring Log No. GZB-1. 3. Groundwater encountered at approximately 11 feet. 4. Encountered obstruction at 14'; refusal at 15'; augers through obstruction at 18.5'. 5. Encountered obstruction at 19.5'-21.8'; and 25'-26.5'.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-3

C S N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
	No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
	S-7	24/24	28.5- 30.5	5-5	ND	Stiff, gray, Silty CLAY (very highly plastic).				NO EQUIPMENT INSTALLED
35	S-8	24/24	35-37	2-2 4-4	0.2	Medium stiff, gray, Silty CLAY (moist very highly plastic).	GRAY SILTY CLAY			
40	S-9	24/24	40-42	1-1	ND	Soft, gray, Silty CLAY (moist, very highly plastic).				Backfill Material 0-100'
	S-9A			2-2		S-9A: Soft, gray, Silty CLAY, trace(+) fine Sand and Silt partings.				
							43.5' ±			
							GRAY SILT AND CLAY			
45	S-10	24/24	45-47	1-1	ND	Very soft, SILT and CLAY (moist, low plasticity).				
	S-10A			1-2						
							48.5' ±			
50	S-11	24/24	50-52	2-1 3-3	ND	Soft, gray, Silty CLAY (very highly plastic).				
55	S-12	24/24	55-57	2-3 2-2	ND	Medium stiff, gray, Silty CLAY (very highly plastic).				
60	S-13	24/24	60-62	2-2 3-4	ND	Medium stiff, gray, Silty CLAY (very highly plastic).				

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Depth Feet	C S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-14	24/24	65-67	2-3 4-4	ND	Medium stiff, gray, Silty CLAY (very highly plastic).				NO EQUIPMENT INSTALLED
70		S-15	24/24	70-72	1-3 2-4	ND	Medium stiff, gray, Silty CLAY (very highly plastic).	GRAY SILTY CLAY			
75		S-16	24/18	75-77	2-2 2-2	ND	Soft, gray, Silty CLAY (very highly plastic).				Backfill Material 0-100'
								± 78'			
		S-17	24/4	78-80	43-61 60-74	ND	Very dense, gray GRAVEL and fine to coarse SAND, trace(+) Silt.		6.		
80								GLACIAL TILL			
		S-18	24/0	83-85	115-59 36-34	ND	No Recovery.				
		S-19	19/4	85-86.5	37-46 58-115/2"	1.4	Very dense, gray GRAVEL, some Silt and fractured Rock, little fine to coarse Sand (Sand mostly wash from S-18). Dropped 3" NW CASING to 90'.	± 86.6'			
					min/ft						
90		C-1	60/ 59.5	90-95	3 3.5 4 3.5 3.2	RQD=99	Hard, freshly weathered, slightly fractured sound, dark gray ARGILLITE; close to moderately close drilling breaks parallel-perpendicular to bedding planes; occasional calcite fillings parallel-perpendicular to bedding planes.	ARGILLITE BEDROCK	7.		
95		C-2	60/60	95-100	3 min. 3.1 3.2 3.5 4.1		Hard, freshly weathered, slightly fractured sound, dark gray ARGILLITE; close to moderately close drilling breaks parallel-perpendicular to bedding planes; occasional calcite fillings parallel-perpendicular to bedding planes.				

Bottom of Boring at 100 Feet.

6. Driller noted gravel in wash and increased resistance to drill bit at 78 feet.
7. Roller bit through rock between 86.6 and 90 feet.
8. For coring, the number in the blows/6" column is minutes per foot of coring.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-4

Boring No. GZB-4

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(617) 969-0050

ACDC - Parcel B

Chinatown/Boston, Massachusetts

Boring No. GZB-5

Page 1 of 2

File No. 12535

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Foreman George S./Charles L.

GZA Rep. M.A. Ponti/ck

Date Start 6/05/91 End 6/06/91

Location See Exploration Location Plan

GS.Elev. Datum

Casing

Type

I.D./O.D.

Hammer Wt.

Hammer Fall

Other 3-3/4" HSA

Sampler

Split Spoon

2"

140#

30"

Groundwater Readings

Date	Time	Depth	Casing	Stab. Time
6/5/91	1400	none	15.5	0 Hrs.
6/7/91	0730	11.75	-	17 ± Hrs.
6/8/91	0630	10.78	-	1.8 days ±
6/19/91	0700			

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-1	24/14	0-2	6-14	ND	Dense, gray, fine to coarse SAND, some(+) Gravel, some(-) Silt (brick, FILL).		1.		Curb Box Concrete 0-0.5'
					16-21				2.		Backfill Material 0.5-7'
5		S-2	24/18	5-7	3-2	0.5	Very loose, gray, fine to coarse SAND and Clayey Silt (moist, FILL).	GRANULAR FILL			1.5" PVC Riser 0-10'
					1-3						Bentonite Seal 7-8'
10		S-3	24/11	9.5-11.5	11-3	1.2	Loose, gray, fine to coarse SAND, some(+) Clayey Silt (wet, FILL).		3.		Filter Sand 8-25'
					7-10						1.5" PVC Wellscreen 10-25'
								± 13.5'			
15		S-4	24/24	15.5-17.5	10-17	ND	Moist, dense, light brown, SILT, some(-) fine Sand.	SILT			
		S-4A			14-12	ND	S-4A: Moist, light brown, Silty CLAY.				
								± 16'			
20		S-5	24/24	20-22	5-6	30	Stiff, olive brown, CLAY and SILT (moist, medium plastic).	CLAY AND SILT			
		S-5A			6-7	1.2					
								± 23.5'			
25		S-6	24/24	25-27	3-4	27	Stiff, gray, Silty CLAY, trace(+) fine Sand and Silt lenses (1-2" thick, moist, highly plastic).	GRAY SILTY CLAY			Backfill Material 25-42'
		S-6A			5-6	ND					

Remarks

- See Remark No. 1 on Boring Log GZB-1.
- Locking curb box installed with concrete at ground surface.
- Obstruction encountered between ± 8 and ± 9.5 feet below existing grade.
- Approximately 5 to 6 inches of fine sand and silt layers were encountered in split spoon samples S-7A and S-8.
- Strong petroleum odor similar to gasoline encountered while adding filter sand; odor stopped after filter sand added to 8 feet below grade.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-5

DEPTH	C S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed		
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data						
		S-7	24/24	30-32	1-3	0.8	Medium stiff, loose, gray, Silty CLAY (moist, highly plastic). S-7A: Gray, fine SAND and SILT (moist, highly plastic). S-7B: Gray, Silty CLAY (moist, highly plastic).	F.SAND&SILT	4.		Backfill Material 25-42'	
		S-7A/S-7B			4-5	0.2/ND		GRAY SILTY CLAY ± 33.5'				
								FINE SAND & SILT ± 35.5'				
35		S-8	24/24	35-37	3-4	ND	Loose, gray, fine SAND and SILT, trace(+) Clay (moist). S-8A: Medium stiff, gray, Silty CLAY, (moist, highly plastic).		4.			
	S-8A				4-5	ND		GRAY SILTY CLAY				
40		S-9	24/24	40-42	3-4	ND	Stiff, gray, Silty CLAY (moist, highly plastic).		5.			
					5-5							
							Bottom of Boring at ± 42 Feet.					
45												
50												
55												
60												

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-5

GZA GeoEnvironmental, Inc.
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ACDC - Parcel B

Chinatown/Boston, Massachusetts

Boring No. GZB-6

Page 1 of 2

File No. 12535

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Foreman C. Linling

GZA Rep. M.A. Ponti/ck

Date Start 6/08/91 End 6/08/91

Location See Exploration Location Plan

GS.Elev. Datum

Casing

Sampler

Groundwater Readings

Type

HW/NW

Split Spoon

Date

Time

Depth

Casing

Stab. Time

I.D./O.D.

4"/3"

2"

6/8/91

1150

10.75

25'

0 Hrs.

Hammer Wt.

300#

140#

6/10/91

0610

10.64

Out

± 1.8 days

Hammer Fall

24"

30"

6/21/91

0800

10.79

Out

± 11 days

Other 3-3/4" HSA

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data					
		S-1	24/14	0-2	11-12	ND	Medium dense, black, fine to coarse SAND, some(+) Gravel, some(-) Silt (brick, FILL).				Curb Box Concrete 0-0.5'
					17-14						Backfill Material 0.5-7'
5		S-2	24/19	5-7	3-4	ND	Medium dense, black, fine to coarse SAND, some(+) Gravel, some(-) Silt (concrete, brick, FILL). S-2A: Olive brown, SILT and CLAY.	GRANULAR FILL			1.5" PVC Riser 0-10'
		S-2A			7-7	ND					Bentonite Seal 7-8'
											Filter Sand 8-25'
10		S-3	24/18	10-12	7-9	22	Medium dense, black, fine to coarse SAND, some(+) Silt (brick, FILL). S-3A: Olive brown, SILT and CLAY (FILL).				1.5" PVC Wellscreen 10-25'
		S-3A			11-15	1.2		± 13.5'			
15		S-4	24/24	15-17	3-4	0.3	Stiff, olive brown, SILT and CLAY (moist). S-4A: Olive brown, SILT and CLAY with trace 1/16" tan, fine SAND and SILT laminae (moist).	OLIVE BROWN SILT AND CLAY			
		S-4A			4-5			± 18.5'			
20		S-5	24/24	20-22	3-4	ND	Stiff, gray, Silty CLAY (moist, highly plastic).				
					4-5			GRAY SILTY CLAY			
25		S-6	24/24	25-27	1-2	0.6	Medium stiff, gray, Silty CLAY, trace(-) Silt laminae (moist). S-6A: Gray, Silty CLAY.				
		S-6A			3-4	0.2					Backfill Material 25-42'

- REMARKS
- See Remark No. 1 on Boring Log GZB-1.
 - Locking curb box with concrete installed at ground surface.
 - Occasional 1/16" laminae of fine Sand/Silt.
 - Sample appeared to expand inside sample jar.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZB-6

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Chinatown/Boston, Massachusetts

File No. 12547

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Casing

Sampler

Groundwater Readings

Foreman C. Lenling/P.Brown

Type

HW/NW

Split Spoon

Date

Time

Depth

Casing

Stab. Time

GZA Rep. M.A. Ponti, Jr./ck

I.D./O.D.

4"/3"

2"

6/28/91

1330

11.5'

20

0 Hrs.

Date Start 6/28/91 End 6/28/91

Hammer Wt.

300#

140#

Location See Exploration Location Plan

Hammer Fall 24"

30"

GS.Elev. Datum

Other 3-3/4" Hollow Stem Auger

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data				
		S-1	24/17	0-2	9-11	ND	Medium dense, gray, fine to coarse SAND, little(+) Gravel, little(+) Silt (concrete FILL).	2" ASPHALT		Curb Box Concrete 0-0.5'
					14-13					Backfill Material 0.5-7'
5		S-2	24/13	5-7	2-3	ND	Very loose, olive-brown, fine to coarse SAND, some(+) Silt, trace(-) Clay (FILL).	GRANULAR FILL		1.5" PVC Riser 0-10'
					1-1					Bentonite Seal 7-8'
								± 8.5'		Filter Sand 8-20'
10		S-3	24/22	10-12	2-7	ND	Very stiff olive-brown SILT and CLAY (wet).	SILT AND CLAY		1.5" PVC Wellscreen 10-20'
					12-14					
								± 13.5'		
15		S-4	24/24	15-17	6-5	ND	Stiff, gray, Silty CLAY (moist, highly plastic).			
					9-12					
20		S-5	24/24	20-22	2-4	ND	Stiff, gray, Silty CLAY (moist, highly plastic).	GRAY SILTY CLAY		
				20-22	6-6					Backfill Material 20-106.5'
25		S-6	24/24	25-27	6-6		Stiff, gray, Silty CLAY (moist, highly plastic).			
					6-9					

1. H-Nu readings represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using an H-Nu Model PI-101 photoionization analyzer. Results in parts per million (ppm). ND indicates nothing detected. N indicates negative deflection of the water and may be due to high concentrations of non-ionizable species such as methane, carbon dioxide or moisture. Testing performed at GZA's Newton laboratory.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-1

GZA GEDENVIRONMENTAL, INC.
Engineers/Scientists

CEDC - Parcel A

Boring No. GZA-1

Page 2 of 2

File No. 12547

Chkd. By: FMG

320 Needham Street
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(617) 969-0050

Chinatown/Boston, Massachusetts

[illegible]

Boring No. GZA-1

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A

Chinatown/Boston, Massachusetts

Boring No. GZA-2

Page 1 of 4

File No. 12547

Chkd. By: FMG

Boring Co.	GZA Drilling, Inc.	Casing	Sampler	Groundwater Readings					
Foreman	C. Lenling/P.Brown	Type	HW/NW	Split Spoon	Date	Time	Depth	Casing	Stab. Time
GZA Rep.	M.A. Ponti, Jr./ck	I.D./O.D.	4"/3"	2"	6/19/91	1000	12'	15'	0 Hrs.
Date Start	6/28/91	End	6/28/91	Hammer Wt.	300#	140#			
Location	See Exploration Location Plan	Hammer Fall	24"	30"					
GS.Elev.	Datum	Other	3-3/4" Hollow Stem Auger						

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data				
		S-1	24/17	0-2	5-4	ND	Medium dense, black, fine to coarse SAND, some(+) Silt, little(+) Gravel Brick (FILL).	2" ASPHALT		Curb Box Concrete 0-0.5'
					7-8					Backfill Material 0.5-7'
5		S-2	24/15	5-7	11-12	0.7	Medium dense, black, fine to coarse SAND, some(+) Silt, little(+) Gravel Brick (FILL).	GRANULAR FILL		1.5" PVC Riser 0-10'
					17-21					Bentonite Seal 7-8'
10		S-3	24/15	10-12	11-18	0.9	Dense, olive brown, fine to coarse SAND, some(+) Gravel, little(+) Silt and Clay, Brick (FILL) (wet).	± 13.5'		Filter Sand 8-20'
					23-6					1.5" PVC Wellscreen 10-20'
15		S-4	24/21	15-17	14-15	ND	Hard, olive brown, SILT and CLAY (moist).	SILT AND CLAY		
					13-17					
20		S-5	24/14	20-22	31-30	2.8	Hard, olive brown, SILT and CLAY (moist).	± 23.5'		Backfill Material 20-106.5'
					32-44					
25		S-6	24/19	25-27	3-4	ND	Medium stiff, gray, Silty CLAY (moist).	GRAY SILTY CLAY		
					4-5					

- See Note 1 on Boring Log GZA-1.
- See Note 2 on Boring Log GZA-1.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-2

C S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
	No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
	S-7	24/22	30-32	2-2 5-4	ND	Medium stiff, gray, Silty CLAY, little(+) Silt and fine Sand laminae layers (moist).				
35	S-8	24/24	35-37	3-2 4-5	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).				
40	T-1	24/22	40-42	300 psi push						
	S-9	24/23	42-44	4-3 3-6	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).				
45										
50	T-2	24/12	50-52	300 psi push						
	S-10	24/24	52-54	2-4 6-7	ND	Stiff, gray, Silty CLAY, little(+) Silt and fine Sand layers/laminae.				
55										
60	T-3	24/19	60-62	300 psi push						
	S-11	24/22	62-64	5-6 7-10	ND	Stiff, gray, Silty CLAY, trace(-) fine to medium Sand.				

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Chinatown/Boston, Massachusetts

File No. 12547

Chkd. By: FMG

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
70		T-4	24/21	70-72	300 psi push						
		S-12	24/23	72-74	WOR-4	ND	Stiff, gray, Silty CLAY, trace(-) fine to coarse Sand (moist).	GRAY SILTY CLAY	3.		
					5-4						
75											
80		S-13	24/13	80-82	16-17	0.1	Dense, gray, fine to coarse SAND, some(+) Silt and Clay (wet).				
					16-18						
85		S-14	24/14	85-87	27-38	ND					
					47-64						
90		S-15	0/0	90-90	38/0"		No Recovery.				
		R-1	60/18	92.5- 97.5	3			ARGILLITE BEDROCK			
					3-5						
					4						
95					4						
					5						
		R-2		97.5- 102.5	4	RQD=57	Hard, freshly weathered, slightly fractured, dark gray, amorphous; ARGILLITE; close, moderately dipping drilling breaks along thin bedding planes (parallel and perpendicular				
					5.3						
					5.1						

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Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-2

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A

Chinatown/Boston, Massachusetts

Boring No. GZA-3

Page 1 of 3

File No. 12547

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Operator C. Lenling/P. Brown

QA Rep. M.A. Ponti, Jr./ck

Start Date 6/28/91 End 6/28/91

Location See Exploration Location Plan

S.Elev. Datum

Casing

Sampler

Groundwater Readings

Type

HW/NW

Split Spoon

Date

Time

Depth

Casing

Stab. Time

I.D./O.D.

4"/3"

2"

6/28/91

1330

11.5'

20

0 Hrs.

Hammer Wt.

300#

140#

Hammer Fall

24"

30"

Other

3-3/4" Hollow Stem Auger

C S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
	No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data					
	S-1	24/18	0-2	3-7	ND	Medium dense, gray-black, fine to coarse SAND, some(-) Gravel, little (+) Silt, Brick, (FILL).	2" ASPHALT	1.		No Equipment Installed
				5-5			GRANULAR FILL			
5	S-2	24/17	5-7	6-6	ND	Medium dense, dark brown, fine to coarse SAND, some(+) Silt, little(+) Gravel, Brick, (FILL).	± 9'			
				8-10						
10	S-3	24/19	10-12	4-9	ND	Very stiff, olive-brown, SILT and CLAY, little(-) fine Sand, trace(+) Gravel (wet, plastic).	SILT AND CLAY			
				8-12			± 13.5'			Backfill Material 0-73.1'
15	S-4	24/16	15-17	2-4	ND	Medium stiff, gray Silty CLAY, trace(-) fine Sand and Silt partings (moist, highly plastic).				
				4-5						
20	S-5	24/24	20-22	5-7	ND	Very stiff, gray, Silty CLAY, trace (-) fine Sand and Silt partings (moist, highly plastic).	GRAY SILTY CLAY			
				10-9						
25	S-6	24/24	25-27	3-5	ND	Stiff, gray, Silty CLAY (moist, highly plastic).				
				7-7						

- See Remark No. 1 on Boring Log GZA-1.
- No samples taken between 37 and 73 feet below grade; observed gray washwater to 73 feet.
- Used 3" HW casing to advance hole between 37 and 73 feet where casing could not advance any more; no coarse material (till) was observed within return water; Sample S-9 advanced to 73.1 feet to refusal, no sample was recovered.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-3

320 Needham Street
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(617) 969-0050

Chinatown/Boston, Massachusetts

DEPTH	C B S L N W G S	Sample Information					Sample	Stratum	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data	Description & Classification	Description		
		S-7	24/24	30-32	3-3	ND	Medium stiff, gray, Silty CLAY, little(-) fine Sand and Silt partings, (moist, highly plastic).			
					5-6					
35		S-8	24/24	35-37	2-2	ND	Medium stiff, gray, Silty CLAY, little(+) fine Sand and Silt partings (moist, highly plastic).		2.	
					3-4					
40							(No Samples Taken)			
45										
50										
55										

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data					
							No Samples Taken.	GRAY SILTY CLAY			Backfill Material 0-73.1'
70											
							No Recovery				
		S-9	1/1	73-73.1	120/1"	ND	Bottom of Boring at 73.1 Feet.		3.		
75											
80											
85											
90											
95											

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Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-3



GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A
Chinatown/Boston, Massachusetts

Boring No. GZA-4
Page 1 of 3
File No. 12547
Chkd. By: FMG

Boring Co. GZA Drilling, Inc.
Foreman C. Lenling/P.Brown
GZA Rep. M.A. Ponti, Jr./ck
Date Start 6/24/91 End 6/26/91
Location See Exploration Location Plan
GS.Elev. Datum
Casing HW/NW Split Spoon
Type I.D./O.D. 4"/3" 2"
Hammer Wt. 300# 140#
Hammer Fall 24" 30"
Other 3-3/4" HSA; NX Split Barrel

Groundwater Readings				
Date	Time	Depth	Casing	Stab. Time
6/24/91	1400	11.5'	15'	0 Hrs.

DPTH	CBL SL NW GS	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data				
		S-1	24/15	0-2	11-14	3.7	Dense, brown, fine to medium SAND, little(+) Silt, trace(+) fine Gravel.	2' ASPHALT		Curb Box Concrete 0-0.5'
					17-19					Backfill Sand 0.5-7'
5		S-2	24/24	5-7	15-6	6.0	Medium dense, brown, fine to medium SAND, some (-) fine Gravel, little (-) Silt, trace Brick.	GRANULAR FILL		1 1/2" PVC Riser 0-10'
					5-10					Bentonite Seal 7-8'
10		S-3	24/24	10-12	2-3	ND	Loose, gray-brown, fine SAND and SILT.	10' SAND		Filter Sand 8-20'
					3-5					
15		S-4	24/24	15-17	6-5	ND	Stiff, gray CLAY and SILT, trace black organic Silt, fine Gravel.	15' CLAY AND SILT		1 1/2" PVC Wellscreen 10-20'
					6-8					
20		S-5	24/24	20-22	13-19	ND	Hard, yellow CLAY and SILT, trace fine Sand.	± 22.5' GRAY SILTY CLAY		Backfill Sand 20-85'
					21-27					
25		S-6	24/16	23-25	3-4	ND	Stiff, gray, Silty CLAY, occasional fine Sand and Silt parting.			
					5-7					
		S-7	24/22	28-30	3-5	ND	Medium stiff, gray, Silty CLAY, many fine Sand and Silt partings (moist).			
					3-6					

- Remarks
- 1. See Remark No. 1 on Boring Log GZA-1.
 - 2. Locking curb box installed with concrete at ground surface.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-4



D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data				
								31.5' ±		
		S-8	24/20	33-35	3-3	ND	Medium stiff, olive-gray CLAY and SILT, many fine Sand and Silt partings. One fine Sand seam 3" from tip measured 1/8" (moist).			
35					4-5					
		S-9	24/20	38-40	2-4	ND	Top 12": Stiff, gray CLAY and SILT, occasional fine Sand and Silt partings. Bottom 8": Medium dense, gray, fine SAND and Clayey SILT (moist).			
40		S-9A			5-6	ND				
		S-10	24/22	43-45	4-4	ND	Stiff, gray CLAY and SILT, trace (-) fine Gravel, occasional fine Sand and Silt partings (moist).	GRAY CLAY AND SILT		Backfill Material 20-85'
45					6-7					
		S-11	24/24	48-50	3-5	ND	Stiff, gray CLAY and SILT, trace (-) fine to coarse Sand, fine Gravel (moist).			
50					5-6					
								51.5' ±		
		S-12	24/24	53-55	3-5	ND	Stiff, gray, Silty CLAY, trace (-) fine Gravel (moist).			
55					5-6					
		S-13	24/24	58-60	WOR-WOR	ND	Soft, gray, Silty CLAY (moist).	GRAY SILTY CLAY		
60					3-4					
		S-14	24/24	63-65	WOR-WOR	ND	Soft, olive-gray, Silty CLAY (moist).			
					4-5					
Remarks										

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Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-4



GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A

Chinatown/Boston, Massachusetts

Boring No. GZA-5

Page 1 of 2

File No. 12547

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Foreman C. Lenling/P.Brown

GZA Rep. M.A. Ponti, Jr./ck

Date Start 6/29/91 End 6/29/91

Location See Exploration Location Plan

GS.Elev. Datum

Casing Sampler
Type ---- Split Spoon
I.D./O.D. ---- 2"
Hammer Wt. ---- 140#
Hammer Fall ---- 30"
Other 3-3/4" Hollow Stem Auger

Groundwater Readings

Date	Time	Depth	Casing	Stab. Time
6/29/91	1330	11.5'	35'	0 Hours
7/2/91	0715		Out	± 1.3 Days

D P T H	C S L N W S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-1	24/16	0-2	9-15	ND	Medium dense, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel Brick (FILL).	2" ASPHALT	1.		Curb Box
					6-10				2.		Concrete 0-0.5'
											Backfill Sand 0.5-6'
											1 1/2" PVC Riser 0-10'
5		S-2	24/17	5-7	7-7	ND	Medium dense, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel Brick (FILL).	GRANULAR FILL	3.		Bentonite Seal 6-7'
					11-13						
10		S-3	24/24	10-12	3-2	8.2	Medium stiff, gray, Silty CLAY, trace (+) black organics, Wood, (moist, highly plastic).	13.5' ±			Filter Sand 7-20'
					2-6						
15		S-4	24/	15-17	5-5	ND	Stiff, gray, Silty CLAY, trace (+) fine Sand and Silt partings (moist, highly plastic).				1 1/2" PVC Wellscreen 10-20'
					7-3						
20		S-5	24/24	20-22	3-4	ND	Stiff, gray, Silty CLAY (moist, highly plastic).	GRAY SILTY CLAY			
					4-4						
25		T-1	24/24	25-27	300 psi						Backfill Material 20-39'
		S-6	24/24	27-29	3-5	ND	Stiff, gray, Silty CLAY, little (+) fine Sand and Silt partings (moist, plastic).				
					4-6						

- Remarks
- See Remark No. 1 on Boring Log GZA-1.
 - Locking curb box installed with concrete at ground surface.
 - Encountered obstruction between ± 7.5 and ± 9.8 feet below grade.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-5

[illegible]

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-5

Boring Co.	GZA Drilling, Inc.	Casing	Split Spoon	Groundwater Readings				
Foreman	C. Lenling/P.Brown	Type	----	Date	Time	Depth	Casing	Stab. Time
GZA Rep.	M.A. Ponti, Jr./ck	I.D./O.D.	----	6/29/91	0920	10.9'	20'	0 Hours
Date Start	6/29/91	End	6/29/91					
Location	See Exploration Location Plan	Hammer Wt.	----					
		Hammer Fall	----					
GS.Elev.	Datum	Other	3-3/4" Hollow Stem Auger					

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-1	24/14	0-2	10-5	ND	Loose, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel (Brick, Asphalt, FILL).	2" ASPHALT			No Equipment Installed
					4-4						
5		S-2	24/14	5-7	6-11	ND	Medium dense, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel, trace (-) Clay, Brick (FILL).	GRANULAR FILL			
					12-9						
10		S-3	24/21	10-12	8-9	ND	Very stiff, olive-brown SILT and CLAY, little (+) fine to coarse Sand, Brick, Asphalt (FILL).	± 13.5'			
					9-11						
15		S-4	24/23	15-17	7-10	ND	Very stiff, olive-brown SILT and CLAY, little (-) fine Sand (moist).	SILT AND CLAY			Backfill Material 0-32'
					8-12						
20		S-5	24/24	20-22	2-3	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).	± 18.5'			
					4-4						
25		S-6	24/24	25-27	1-4	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).	GRAY SILTY CLAY			
					3-6						

1. See Remark No. 1 on Boring Log GZA-1.

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GZA GeoEnvironmental, Inc.
Engineers/Scientists

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A

Chinatown/Boston, Massachusetts

Boring No. GZA-7

Page 1 of 2

File No. 12547

Chkd. By: FMG

Boring Co. GZA Drilling, Inc.

Foreman C. Lenling/P.Brown

GZA Rep. M.A. Ponti, Jr./ck

Date Start 6/22/91 End 6/22/91

Location See Exploration Location Plan

GS.Elev. Datum

Casing

Type ----

I.D./O.D. ----

Hammer Wt. ----

Hammer Fall ----

Other 3-3/4" Hollow Stem Auger

Sampler

Split Spoon

2"

140#

30"

Groundwater Readings

Date

Time

Depth

Casing

Stab. Time

6/22/91

0930

11.1'

20'

0 Hours

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNu Test Data				
5		S-1	24/17	0-2	8-6	ND	Medium dense, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel (Brick, FILL).		1.	No Equipment Installed
					5-9					
10		S-2	24/11	5-7	26-38	0.6	Very dense, brown-gray, fine to coarse SAND, little (+) Silt, little (+) Gravel (Brick, Concrete, FILL).	GRANULAR FILL		
					43-87					
15		S-3	24/13	10-12	42-26	0.6	Dense, brown, fine to coarse SAND, some (+) Silt, little (+) Gravel (Wood, Brick, FILL).	± 13.5'		
					20-13					
20		S-4	24/15	15-17	9-1	ND	Soft, olive-brown and gray, Silty CLAY, little (+) fine Sand and Silt partings, lenses (moist, medium plastic).			Backfill Material 0-32'
					1-4					
25		S-5	24/22	20-22	3-4	0.8	Stiff, olive-gray, Silty CLAY, trace (-) fine to coarse Sand (Wood, wet).	GRAY SILTY CLAY		
					5-7					
		S-6	24/24	25-27	2-3	ND	Medium stiff, gray, Silty CLAY (moist, highly plastic).			
					3-3					

Remarks

1. Refer to Remark No. 1 on Boring Log GZA-1.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-7

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

CEDC - Parcel A

Chinatown/Boston, Massachusetts

Boring No. GZA-8

Page 1 of 2

File No. 12547

Chkd. By: FMG

Boring Co.		Casing	Sampler	Groundwater Readings				
GZA Drilling, Inc.				Date	Time	Depth	Casing	Stab. Time
Operator	C. Lenling/P.Brown	Type	Split Spoon	6/22/91	1300	10.8'	Out	0 Hours
QA Rep.	M.A. Ponti, Jr./ck	I.D./O.D.	2"	7/2/91	0800	9.78'	Out	± 10 Days
Date Start 6/22/91 End 6/22/91		Hammer Wt.	140#					
Location See Exploration Location Plan		Hammer Fall	30"					
S.Elev. Datum		Other 3-3/4" Hollow Stem Auger						

Depth Feet	C S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed	
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	HNU Test Data					
		S-1	24/15	0-2	9-14	1.8	Dense, dark brown, fine to coarse SAND, some (-) Silt (Brick, FILL).		1.	Curb Box	
					18-13				2.	Concrete	
										0-0.5'	
										Backfill	
										Sand 0.5-7'	
5		S-2	24/16	5-7	16-21	ND	Dense, dark brown, fine to coarse SAND, some (+) Silt, little (+) Gravel, Brick, Concrete (FILL).	GRANULAR FILL		1 1/2" PVC Riser 0-10'	
					16-12						
										Bentonite Seal 7-8'	
10		S-3	24/13	10-12	1-2	ND	Very soft, black, Organic SILT, little (+) fine to coarse Sand (FILL).				
					1-2						
								± 13.5'		Filter Sand 8-20'	
15		S-4	24/22	15-17	5-6	ND	Stiff, olive, brown-gray, Silty CLAY (moist, highly plastic).				
		S-4A			8-8		S-4A: Stiff, olive brown-gray, Silty CLAY, trace (-) Wood (moist, highly plastic).	OLIVE BROWN SILTY CLAY		1 1/2" PVC Wellscreen 10-20'	
20		S-5	24/23	20-22	2-3	ND	Medium stiff, olive brown-gray, Silty CLAY (moist, highly plastic).				
					3-3			± 23.5'			
25		S-6	24/24	25-27	2-2	ND	Medium stiff, gray, Silty CLAY, little (+) fine Sand/Silt lenses/ laminae (moist, highly plastic).	GRAY SILTY CLAY		Backfill Sand 20-32'	
					4-6						

- See Remark No. 1 on Boring Log GZA-1.
- Locking curb box installed with concrete at ground surface.

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-8

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Chinatown/Boston, Massachusetts

Chkd. By: FMG

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-8

Boring No. GZA-8

Chkd. By: JRB

Other

Boring No. GZA-9

GZA GeoEnvironmental, Inc.
Engineers/Scientists
320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Parcels A and B, Washington St.

Boston, Massachusetts

Boring No. GZA-10

Page 1 of 1

File No. 12854

Chkd. By: JRB

Boring Co. GZA Drilling, Inc.

Foreman R. Jones

GZA Rep. D. Giuliano:mem

Date Start 2/24/92 End 2/24/92

Location See Exploration Location Plan

IS.Elev. Datum

Casing

Type H.S.A.

I.D./O.D. 3-3/4"

Hammer Wt. 140 lbs.

Hammer Fall 30"

Other

Sampler

SS

1-3/8"

140 lbs.

30"

Groundwater Readings

Date	Time	Depth	Casing	Stab. Time
02/24/92	1530	13.5'	OUT	4 Hours

D P T H	C B S L N W G S	Sample Information					Sample Description & Classification	Stratum Description	R M K S	Equipment Installed
		No.	Pen./ Rec.	Depth (Ft.)	Blows/ 6"	Test Data				
		S-1	24/12	.5-2.5	3-5	.7	Rock dust over Asphalt over brown, loose, fine to coarse SAND, some Gravel, trace(-) Silt.	ROCKDUST/ ASPHALT .2'		
					5-5			Fill		
5		S-2	24/8	5-7	2-1	ND	Loose, brown, fine to coarse SAND, some Gravel, trace(-) Silt.			
					1-1					
							Very stiff, brown Silty CLAY.	9'		
10		S-3	24/20	10-12	6-12	ND		SILTY CLAY		
					11-13			14'		
							Stiff, brown, Silty CLAY.	CLAY		
15		S-4	24/24	15-17	4-6	ND				
					8-8		Bottom of Boring at 17 feet.			

1. See Remark No. 1 on Boring Log GZA-9.

REMARKS

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-10

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Boston, Massachusetts

Chkd. By: JRB

S.Elev. Datum

30"

4 Hours

Equipment Installed	
	Roadbox
	Cement 0'-.5'
	Fill .5'-2'
	Bentonite Seal 2'-3'
	Filter Sand 3'-13.5'
	1-1/2" PVC Riser 0'-3.5'
	1-1/2" PVC Wellscreen 3.5'-13.5'

1. See Remark 1 on Boring Log GZA-9.
2. Refusal encountered at 13.5 feet; sample collected off Auger flight, no split spoon sample taken.

Remarks

trification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-11

320 Needham Street
Newton Upper Falls, Massachusetts 02164
(617) 969-0050

Boston, Massachusetts

Chkd. By: JRB

S.Elev.	Datum
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Groundwater Readings

Stab. Time

Completion

30"

Other

Remarks

tratilication lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Boring No. GZA-12

Groundwater Readings

Stah. Time	
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Completion

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Page 10 of 10

Other

Boring No. GZA-13



APPENDIX D
CHEMICAL ANALYSES DATA REPORTS

SOIL

PORTABLE ORGANIC VAPOR ANALYZER RESULTS

(☒ H-Nu Model PI-101, 10.2 eV)(☐ AID Model 580, 10.2eV)Project No.: 12854Project Manager: GulianoDate Collected: 2-24-92Date Analyzed: 2-25-92Sample Type: SOILSample Volume: 30ccSample Temp: 24°CBackground: 3

BORING NUMBER	SAMPLE NUMBER	SCALE			COMMENTS
		0-20	0-200	0-2000	
GZA-9	S-1	1.1			All *
	S-2	1.1			
	S-3	1.1			
	S-4	1.1			
GZA-10	S-1	ND			
	S-2	ND			
	S-3	ND			
	S-4	ND			
GZA-11	S-1	1.3			
	S-2	ND			
	S-3	ND			
	S-4	1.3			
GZA-12	S-1	ND			
	S-2	ND			
	S-3	ND			
	S-4	ND			
GZA-13	S-1	1.5			
	S-2	1.6			
	S-3	3			
	S-4	ND			

* - Samples are in the gray fridge in receiving.

** - Samples are going to be GC per sign in sheet.

ANALYZED BY

Melanie R. Lombardo

REVIEWED BY

W. Wong

JOB DESCRIPTION: ACC - PARCEL A - BOSTON, MA
 JOB #: 12547.1
 DATE SAMPLED: 6/19-29/91
 DATE TESTED: 7/5/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050, x-289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION - PPB, ug/kg of wet soil)

SAMPLE NAME: GZA LAB #:	Method Blank 06505-B	GZA-2 S-2 36505-S	GZA-2 S-3 36506-S	GZA-2 S-5 36507-S	GZA-2 S-13 36508-S	GZA-4 S-1 36509-S	METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	20
2. TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	10
3. 1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND	ND	ND	ND	ND	10
5. METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND	20
6. VINYL CHLORIDE	ND	ND	ND	ND	ND	ND	20
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	20
8. 1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	10
9. 1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	10
10. CHLOROETHANE	ND	ND	ND	ND	ND	ND	10
11. METHYL- <i>t</i> -BUTYL ETHER	ND	ND	ND	ND	ND	TRACE	10
12. BENZENE	ND	ND	ND	ND	ND	ND	10
13. TOLUENE	ND	ND	ND	ND	ND	ND	10
14. ETHYL BENZENE	ND	ND	ND	ND	ND	ND	10
15. <i>m,p</i> -XYLENES	ND	ND	ND	ND	ND	ND	20
16. <i>o</i> -XYLENE	ND	ND	ND	ND	ND	ND	20
17. ACETONE	ND	ND	ND	ND	ND	ND	10
18. METHYL ETHYL KETONE	ND	ND	ND	ND	ND	ND	10
19. METHYL ISOBUTYL KETONE	ND	ND	ND	ND	ND	ND	10
20. CHLOROFORM	ND	ND	ND	ND	ND	ND	40
21. FREON 113 (CCl3-CF3)	ND	ND	ND	ND	ND	ND	30
22. CHLOROBENZENE	ND	ND	ND	ND	ND	ND	20
23. STYRENE	ND	ND	ND	ND	ND	ND	30
TOTAL COMPOUNDS (1-23)	ND	ND	ND	ND	ND	TRACE	
METHANE (V/V-air, PPM)	ND	ND	ND	ND	ND	ND	10 PPM
UNKNOWN(S) (#)	ND	ND	ND	ND	ND	(17)	

COMMENTS: Results are reported with two (2) significant digits. The pattern of the chromatogram for sample GZA-4, S-1 indicates the presence of one or more unknown petroleum distillates such as a gasoline and/or a fuel oil.

ANALYZED BY

Julie Blackwell

REVIEWED BY

CW Pickering

JOB DESCRIPTION: ACC - PARCEL A - BOSTON, MA
 JOB #: 12547.1
 DATE SAMPLED: 6/19-29/91
 DATE TESTED: 7/5/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050, x-289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION - PPB, ug/kg of wet soil)

SAMPLE NAME: GZA LAB #:	Method Blank 06505-B	GZA-4 S-2 36510-S	GZA-5 S-3 36511-S	GZA-7 S-2 36512-S	GZA-7 S-3 36513-S	GZA-7 S-5 36514-S	METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	20
2. TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	10
3. 1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	10
4. TOTAL 1,2-DICHLOROETHENES	ND	ND	ND	ND	ND	ND	10
5. METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND	20
6. VINYL CHLORIDE	ND	ND	ND	ND	ND	ND	20
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	20
8. 1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	10
9. 1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	10
10. CHLOROETHANE	ND	ND	ND	ND	ND	ND	10
11. METHYL-t-BUTYL ETHER	ND	ND	ND	ND	ND	ND	10
12. BENZENE	ND	ND	ND	ND	ND	ND	10
13. TOLUENE	ND	TRACE	ND	ND	ND	ND	10
14. ETHYL BENZENE	ND	TRACE	ND	ND	ND	ND	10
15. m,p-XYLENES	ND	TRACE	ND	ND	ND	ND	20
16. o-XYLENE	ND	TRACE	ND	ND	ND	ND	20
17. ACETONE	ND	ND	ND	ND	ND	ND	10
18. METHYL ETHYL KETONE	ND	ND	ND	ND	ND	ND	10
19. METHYL ISOBUTYL KETONE	ND	ND	ND	ND	ND	ND	10
20. CHLOROFORM	ND	ND	ND	ND	ND	ND	40
21. FREON 113 (CCI3-CF3)	ND	ND	ND	ND	ND	ND	30
22. CHLOROBENZENE	ND	ND	ND	ND	ND	ND	20
23. STYRENE	ND	ND	ND	ND	ND	ND	30
TOTAL COMPOUNDS (1-23)	ND	TRACE	ND	ND	ND	ND	
METHANE (V/V-air, PPM)	ND	ND	19	ND	ND	ND	10 PPM
UNKNOWN(S) (#)	ND	(10)	(3)	ND	(1)	(1)	

COMMENTS: Results are reported with two (2) significant digits. The pattern of the chromatogram for sample GZA-4, S-2 indicates the presence of one or more unknown petroleum distillates such as a gasoline and/or a fuel oil. Trace levels of three (3) late eluting, possibly semi-volatile, unknown compounds were detected in sample GZA-5, S-3. Trace levels of one (1) early eluting unknown compound, which can be tentatively identified as methanol, were detected in samples GZA-7, S-3; and GZA-7, S-5. Methanol is a laboratory artifact that is inherent to this method and is most likely not present in samples GZA-7, S-3; and GZA-7, S-5.

ANALYZED BY

Julie Blackwell

REVIEWED BY

W. Pickering

JOB DESCRIPTION: ACC – PARCEL A – BOSTON, MA
 JOB #: 12547.1
 DATE SAMPLED: 6/19–29/91
 DATE TESTED: 7/5/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969–0050, x–289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION – PPB, ug/kg of wet soil)

SAMPLE NAME: GZA LAB #:	Method Blank 06515–B	GZA–8 S–1 36515–S					METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND					20
2. TRICHLOROETHENE	ND	ND					10
3. 1,1-DICHLOROETHENE	ND	ND					10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND					10
5. METHYLENE CHLORIDE	ND	ND					20
6. VINYL CHLORIDE	ND	ND					20
7. 1,1,1-TRICHLOROETHANE	ND	ND					20
8. 1,1-DICHLOROETHANE	ND	ND					10
9. 1,2-DICHLOROETHANE	ND	ND					10
10. CHLOROETHANE	ND	ND					10
11. METHYL-t-BUTYL ETHER	ND	ND					10
12. BENZENE	ND	ND					10
13. TOLUENE	ND	ND					10
14. ETHYL BENZENE	ND	ND					10
15. m,p-XYLENES	ND	ND					20
16. o-XYLENE	ND	ND					20
17. ACETONE	ND	ND					10
18. METHYL ETHYL KETONE	ND	ND					10
19. METHYL ISOBUTYL KETONE	ND	ND					10
20. CHLOROFORM	ND	ND					40
21. FREON 113 (CCl3–CF3)	ND	ND					30
22. CHLOROBENZENE	ND	ND					20
23. STYRENE	ND	ND					30
TOTAL COMPOUNDS (1-23)	ND	ND					
METHANE (V/V–air, PPM)	ND	ND					10 PPM
UNKNOWN(S) (#)	ND	(7)					

COMMENTS: Results are reported with two (2) significant digits. Trace levels of seven (7) variously eluting unknown compounds were detected in sample GZA–8, S–1.

ANALYZED BY *Julie Blackwell*

REVIEWED BY *CW Pichler*

JOB DESCRIPTION: ACDC - PARCEL B - BOSTON, MA
 JOB #: 12535.1
 DATE SAMPLED: 6/25/91
 DATE TESTED: 6/28/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050, x-289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION - PPB, ug/kg of wet soil)

SAMPLE NAME: GZA LAB #:	Method Blank 06442-B	GZB-1 S-2 36442-S	GZB-1 S-3 36443-S	GZB-1 S-4 36444-S	GZB-4 S-5 36445-S		METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND	ND	ND	ND		20
2. TRICHLOROETHENE	ND	ND	ND	ND	ND		10
3. 1,1-DICHLOROETHENE	ND	ND	ND	ND	ND		10
4. TOTAL 1,2-DICHLOROETHENES	ND	ND	ND	ND	ND		10
5. METHYLENE CHLORIDE	ND	ND	ND	ND	ND		20
6. VINYL CHLORIDE	ND	ND	ND	ND	ND		20
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND		20
8. 1,1-DICHLOROETHANE	ND	ND	ND	ND	ND		10
9. 1,2-DICHLOROETHANE	ND	ND	ND	ND	ND		10
10. CHLOROETHANE	ND	ND	ND	ND	ND		10
11. METHYL-t-BUTYL ETHER	ND	ND	ND	ND	ND		10
12. BENZENE	ND	ND	ND	ND	ND		10
13. TOLUENE	ND	ND	ND	ND	ND		10
14. ETHYL BENZENE	ND	ND	ND	ND	ND		10
15. m,p-XYLENES	ND	ND	ND	ND	ND		20
16. o-XYLENE	ND	ND	ND	ND	ND		20
17. ACETONE	ND	ND	ND	ND	ND		10
18. METHYL ETHYL KETONE	ND	ND	ND	ND	ND		10
19. METHYL ISOBUTYL KETONE	ND	ND	ND	ND	ND		10
20. CHLOROFORM	ND	ND	ND	ND	ND		40
21. FREON 113 (CCl3-CF3)	ND	ND	ND	ND	ND		30
22. CHLOROBENZENE	ND	ND	ND	ND	ND		20
23. STYRENE	ND	ND	ND	ND	ND		30
TOTAL COMPOUNDS (1-23)	ND	ND	ND	ND	ND		
METHANE (V/V-air, PPM)	ND	ND	ND	ND	ND		10 PPM
UNKNOWN(S) (#)	ND	(9)	(13)	(6)	ND		

COMMENTS: Results are reported with two (2) significant digits. Trace to high levels of variously eluting unknown compounds were detected in samples GZB-1, S-2; GZB-1, S-3; and GZB-1, S-4.

ANALYZED BY

W. Long for SMB

REVIEWED BY

G. Katarly for EWP

JOB DESCRIPTION: ACDC. PARCEL B – BOSTON, MA
 JOB #: 12535.1
 DATE SAMPLED: 6/5–17/91
 DATE TESTED: 6/18/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969–0050, x–289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION – PPB, ug/kg of wet soil)

SAMPLE NAME:	Method Blank	GZB–2 S–1	GZB–3 S–1	GZB–3 S–2	GZB–5 S–5	GZB–5 S–6	METHOD DETECTION LIMIT
GZA LAB #:	06325–B	36325–S	36326–S	36327–S	36328–S	36329–S	
1. TETRACHLOROETHENE							20
2. TRICHLOROETHENE							10
3. 1,1-DICHLOROETHENE							10
4. TOTAL 1,2- DICHLOROETHENES							10
5. METHYLENE CHLORIDE							20
6. VINYL CHLORIDE							20
7. 1,1,1-TRICHLOROETHANE							20
8. 1,1-DICHLOROETHANE							10
9. 1,2-DICHLOROETHANE							10
10. CHLOROETHANE							10
11. METHYL- <i>t</i> -BUTYL ETHER							10
12. BENZENE							10
13. TOLUENE			TRACE	TRACE			10
14. ETHYL BENZENE				TRACE			10
15. <i>m,p</i> -XYLENES				TRACE			20
16. <i>o</i> -XYLENE				TRACE			20
17. ACETONE							10
18. METHYL ETHYL KETONE							10
19. METHYL ISOBUTYL KETONE							10
20. CHLOROFORM							40
21. FREON 113 (CCl ₃ -CF ₃)							30
22. CHLOROBENZENE							20
23. STYRENE							30
TOTAL COMPOUNDS (1-23)	ND	ND	TRACE	TRACE	ND	ND	
METHANE (V/V–air, PPM)	ND	ND	ND	ND	ND	ND	10 PPM
UNKNOWN(S) (#)	(1)	(2)	(11)	(8)	(9)	(9)	

COMMENTS: Results are reported with two (2) significant digits. Trace to moderate levels of one (1) early eluting unknown compounds, which can be tentatively identified as methanol, were detected in the Method Blank and in samples GZB–2, S–1; GZB–3, S–1; GZB–3, S–2; GZB–5, S–5, and GZB–5, S–6. Trace to moderate levels of late eluting unknown compounds were detected in samples GZB–2, S–1; GZB–3, S–1; GZB–3, S–2; GZB–5, S–5; and GZB–5, S–6.

ANALYZED BY

Alfred For JMB

REVIEWED BY

A. Balady

JOB DESCRIPTION: ACDC. PARCEL B – BOSTON, MA
 JOB #: 12535.1
 DATE SAMPLED: 6/5–17/91
 DATE TESTED: 6/18/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969–0050, x–289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN SOILS
 (CONCENTRATION – PPB, ug/kg of wet soil)

SAMPLE NAME: GZA LAB #:	Method Blank 06325-B	GZB-6 S-3 36330-S					METHOD DETECTION LIMIT
1. TETRACHLOROETHENE							20
2. TRICHLOROETHENE							10
3. 1,1-DICHLOROETHENE							10
4. TOTAL 1,2- DICHLOROETHENES							10
5. METHYLENE CHLORIDE							20
6. VINYL CHLORIDE							20
7. 1,1,1-TRICHLOROETHANE							20
8. 1,1-DICHLOROETHANE							10
9. 1,2-DICHLOROETHANE							10
10. CHLOROETHANE							10
11. METHYL-t-BUTYL ETHER							10
12. BENZENE							10
13. TOLUENE							10
14. ETHYL BENZENE							10
15. m,p-XYLENES							20
16. o-XYLENE							20
17. ACETONE							10
18. METHYL ETHYL KETONE							10
19. METHYL ISOBUTYL KETONE							10
20. CHLOROFORM							40
21. FREON 113 (CCl3-CF3)							30
22. CHLOROBENZENE							20
23. STYRENE							30
TOTAL COMPOUNDS (1-23)	ND	ND					
METHANE (V/V-air, PPM)	ND	ND					10 PPM
UNKNOWN(S) (#)	(1)	(26)					

COMMENTS: Results are reported with two (2) significant digits. A trace level of one (1) early eluting unknown compound, which can be tentatively identified as methanol, was detected in the Method Blank. The pattern of the chromatogram for sample GZB-6, S-3 indicates the presence of an unknown petroleum distillate such as a fuel oil.

ANALYZED BY *W. Long for JMB*

REVIEWED BY *A. Kalady*

GZA GEOENVIRONMENTAL, INC.
ENVIRONMENTAL CHEMISTRY LABORATORY
320 NEEDHAM STREET, NEWTON UPPER FALLS, MA 02164 (617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 6/18/91

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	91.5	70-130	7.1	35
Toluene	94.3	70-130	6.8	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	98.7	70-130	1.2	35
Toluene	102	70-130	1.0	35

GZA GEOENVIRONMENTAL, INC.
ENVIRONMENTAL CHEMISTRY LABORATORY
320 NEEDHAM STREET, NEWTON UPPER FALLS, MA 02164 (617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 7/5/91

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	85.1	70-130	1.0	35
Toluene	84.2	70-130	.3	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

GZA RAPID VOLATILE ORGANIC SCREENING OF SOIL SAMPLES BY THE STATIC HEADSPACE TECHNIQUE

SAMPLE PREPARATION AND ANALYTICAL METHODOLOGY

OVERVIEW

The GZA rapid screening technique for volatile organics in soil estimates concentrations of these compounds from gaseous concentrations measured in air above the sample. The method measures concentrations of contaminants released from the soil samples into the headspace. This method has been developed by the GZA Environmental Chemistry Laboratory as a rapid, reasonably accurate and reliable, and cost effective screening of soil samples for volatile organics. However, this technique is not definitive and is not an EPA approved analytical method.

METHODOLOGY

Soil samples taken in the field are placed in 250 ml glass jars with a teflon gasket lid. The samples are kept at 4 degrees C until the time of analysis. A 10 ml crimp top septum vial is marked and tared with a crimp top on an analytical balance. A subsample of soil is added until all but a 2.5 ml volume of headspace remains. The vial cap is immediately crimped on and the weight of the vial and its contents is again measured to determine the weight of soil added. A 1.0 ml aliquot of headspace gas is withdrawn automatically by a Hewlett Packard 19395A headspace injector. The headspace sample is injected into the sample port of a HP 5890A gas chromatograph where the vapor is split within the injection port and distributed to two 30 meter X 530 micron fused silica capillary columns. Concentrations of eluting volatile organics are measured with dual flame ionization detectors and response data are acquired by a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data are transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatography Software. The information for the analytical report is entered manually onto a Lotus Symphony spreadsheet.

CALIBRATION

The response of the gas chromatograph is calibrated with external standards prepared for concentrations of 0.1, 1.0, and 10 ug/g (ppm) on a mass response basis and introduced into the chromatograph as headspace samples in the same manner as unknown soil samples. Sample peaks are identified by comparing their retention times from both columns to measured retention times of calibration standards for both columns. Qualitative comparisons are made between the two sets of test data for each sample. Sample peaks identified as known compounds are quantified according to response factors determined from calibration standards.

REPORT FORMAT

The method quantitation limit (MQL) for each compound is stated for every report with 95% certainty in an average chromatographic run. Concentration measures in the range of 1 to 5 times the MQL are reported as "Trace". Concentrations less than the MQL may be identified as beneath the method quantitation limit (BMQL) in instances where the compound's presence is 95% certain in that particular chromatogram. The total concentration for all detected compounds for which a calibration has been made, except methane, is summarized in the row designated as "Total Compounds"; none detected, ND, is reported if no known peaks are found. Unidentifiable peaks are reported as "Present" and the number of unknown peaks are reported in parentheses. No unknown peaks detected is reported as "ND".

QUALITY CONTROL

The GZA procedure assumes that response factors are constant over the working range of 10 ppb to 10 ppm and that the precision of the analysis for samples is the same as that for the calibration standards. The 95% confidence limits for a measurement are defined as plus or minus two standard deviations as determined by a Student's t Test on replicate analyses of calibration standards. Quality control standards are analyzed daily and accepted if the relative standard deviation of the response factor is less than 20% of the anticipated value. New calibration curves are prepared when quality control limits are exceeded. Method blanks are prepared in the same manner as samples and are analyzed before each job or no less frequently than every ten samples. Field blanks and trip blanks are submitted at the discretion of the sample submitter. Matrix spikes and duplicate analyses are performed at a frequency of not less than one per twenty or fewer samples and results are reported as matrix spike recoveries and percent differences. Analytical results are not blank corrected.

DISCLAIMER

Identities and concentrations of volatile organic compounds reported by this headspace screening technique are subject to limitations inherent to this method. Chromatographic data are quantified by response factors that assume 100% volatilization of sorbed organic compounds into the headspace. Therefore, the reported concentrations probably represent the lower limits of contamination. If confirmation is desired, duplicate samples should be submitted to a State certified laboratory for analysis by the appropriate EPA protocol methods.

LABORATORY SAMPLE NOTATION:

S - Solid B - Blank

LABORATORY CONTACT PERSON:

Edward W. Pickering, Manager
Environmental Chemistry Laboratory
GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Phone #: (617) 969-0050, x169

REFERENCES

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c. 21E", Policy #WSC-89-004 (1990).

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1/91/DM

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(617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/2/92

SAMPLE NAME: GZA LAB #:	METHOD BLANK 030292-QC	COMP. A 04515-FP
1. HYDROCARBON CONTENT	<10	190
2. PERCENT SOLID CONTENT	N/A	83
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	50
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	2.5
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "COMP. A" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 57 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

R. Sikes

REVIEWED BY:

L. Walsh

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(617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM- $\mu\text{g/g}$ or $\mu\text{g/ml}$)

JOB DESCRIPTION: WASHINGTON ST. – BOSTON, MA

JOB #: 12854

DATE SAMPLED: 2/24/92

DATE TESTED: 3/2/92

SAMPLE NAME:	METHOD BLANK	COMP. B
GZA LAB #:	030292-QC	04516-FP
1. HYDROCARBON CONTENT	<10	280
2. PERCENT SOLID CONTENT	N/A	87
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	50
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	2.5
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "COMP. B" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 28 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

REVIEWED BY:

Wash

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/4/92

SAMPLE NAME:	METHOD	GZA-11, S-4
GZA LAB #:	BLANK	
	030492-QC	04524-FP
1. HYDROCARBON CONTENT	<10	170
2. PERCENT SOLID CONTENT	N/A	81
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	20
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	1.0
6. SURROGATE RECOVERY (O-TERPHENYL)	102%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "GZA-11, S-4" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 40 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

R. Fisher

REVIEWED BY:

Malik

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/4/92

SAMPLE NAME:	METHOD	GZA-13, S-2
GZA LAB #:	BLANK	
	030492-QC	04525-FP
1. HYDROCARBON CONTENT	<10	53
2. PERCENT SOLID CONTENT	N/A	89
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	20
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	1.0
6. SURROGATE RECOVERY (O-TERPHENYL)	102%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "GZA-13, S-2" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 5.9 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

R. Soukup

REVIEWED BY:

H. Walsh

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/2/92

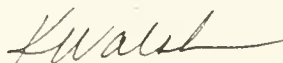
SAMPLE NAME:	METHOD BLANK	GZA-10, S-1
GZA LAB #:	030292-QC	04520-FP
1. HYDROCARBON CONTENT	<10	370
2. PERCENT SOLID CONTENT	N/A	91
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	100
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	50
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "GZA-10, S-1" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 1.1 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:



REVIEWED BY:



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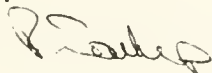
HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/2/92

SAMPLE NAME:	METHOD BLANK	GZA-9, S-1
GZA LAB #:	030292-QC	04519-FP
1. HYDROCARBON CONTENT	<10	830
2. PERCENT SOLID CONTENT	N/A	93
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	200
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	10
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "GZA-9, S-1" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 68 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:



REVIEWED BY:



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MASSACHUSETTS LABORATORY I.D. NO. MA092

HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/2/92

SAMPLE NAME:	METHOD BLANK	COMP. 2
GZA LAB #:	030292-QC	04518-FP
1. HYDROCARBON CONTENT	<10	340
2. PERCENT SOLID CONTENT	N/A	85
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	100
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	5.0
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "COMP. 2" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 22 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

R. Siskup

REVIEWED BY:

K. Walsh

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 2/24/92
DATE TESTED: 3/2/92

SAMPLE NAME:	METHOD	COMP. 1
GZA LAB #:	BLANK	
	030292-QC	04517-FP
1. HYDROCARBON CONTENT	<10	440
2. PERCENT SOLID CONTENT	N/A	90
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT (TOTAL PRODUCT)	10	100
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.5	5.0
6. SURROGATE RECOVERY (O-TERPHENYL)	95%	Diluted Out

QUALITATIVE IDENTIFICATION: The characteristics of the chromatogram for sample "COMP. 1" indicate the presence of a petroleum product in the boiling range of fuel oil #6/asphalt. A total of 82 ug/g total polynuclear aromatic hydrocarbons (PAH's) were also detected which indicate the products of thermal combustion.

ANALYZED BY:

R. E. Eick

REVIEWED BY:

K. Walsh

CHAIN-OF-CUSTODY RECORD

Sample I.D.	Time (Date)	Bailer #	Collector's Initials	Location Description	Sample Type	ANALYSES REQUIRED													Total # of Cont.	Note #							
						524.2	8240	8010	8015	8020	8080	8270	GC Screen	PCB Screen	TCLP	TPH-IR	TPH-GC	PHC-Fing.			HNU	pH	Spec. Cond.	Filtering			
G2A-9/51			DK		Soil																					2	1
1/52																										2	1
1/53																										2	1
G2A-16/59																										3	1
1/52																										2	1
1/53																										2	1
G2A-11/51																										2	1
1/52																										2	1
1/53																										2	1
G2A-12/51																										2	1
1/52																										2	1
1/53																										2	1
TOTAL NUMBER OF CONTAINERS																										2	1

NOTES: 1) Hold duplicates only. (4#)
2) 10/25/2005, etc.: Unless otherwise noted, all VOA vials have been preserved w/ 1:1 HCl in accordance with Mass-DEP Policy.

REINQUISHED BY: (Signature) [Signature] DATE/TIME 17:30/2-24-92 RECEIVED BY: (Signature) [Signature]

REINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

REINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

REINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

ANALYTICAL LABORATORY: _____

LABORATORY CONTACT: _____ PHONE: _____

GZA CONTACT: Guelin EXT: 634c

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS
320 Needham Street
NEWTON UPPER FALLS, MA 02164
(617) 969-0050

GZA FILE NO 128554 PO NO. _____

PROJECT Washington St

LOCATION Boston

COLLECTOR(S) DSC

DATE(S) OF COLLECTION 2-24-92 SHEET 1 OF 2

CHAIN-OF-CUSTODY RECORD

Sample I.D.	Time (24hr.)	Bailer #	Collector's Initials	Location Description	Sample Type	ANALYSES REQUIRED														Total # of Cont.	Note #						
						524.2	8240	8010	8015	8020	8080	8270	GC Screen	PCB Screen	TCLP	TPH-IR	TPH-GC	PHC-Fing.	HNU			pH	Spec. Cond.	Filtering	Rel. Hold		
Q24-12/54			DE		Sci																				2	1	
Q24-13/54																										2	1
Q24-10																										2	1
Q24-11																										2	1

TOTAL NUMBER OF CONTAINERS

REINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

REINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

REINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

REINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

REINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

ANALYTICAL LABORATORY: _____

LABORATORY CONTACT: _____ PHONE: _____

GZA CONTACT: Gullen EXT 634C

GZA GEOENVIRONMENTAL, INC.

ENGINEERS AND SCIENTISTS

320 Needham Street
NEWTON UPPER FALLS, MA 02464
(617) 969-0050

NOTES: Preservatives added. All VOA vials have been preserved w/ 1:1 HCl in accordance with Mass-DEP Policy.

- 1) Hachdruprider only. (H)
- 2) Had PAH's interdruprider notice. (H)
- 3) Underage for Vol's via GC screen on VOA's. (H)

GZA FILE NO. 12854 PO. NO. _____

PROJECT Washington St

LOCATION Boston

COLLECTOR(S) DSG

DATE(S) OF COLLECTION 2-24-92 SHEET 2 OF 2

ANALYSIS TRANSFER RECORD

JOB NUMBER

12854.00

PROJECT MANAGER

Bossange

DATE SAMPLES CAME IN

2-24-92

TYPE OF CONTAINER

Amber

VOA

DJ

SAMPLE TYPE

Soil

Water

Air

SAMPLE ID

Composite A

Composite B

Composite 1

Composite 2

ANALYSIS

PCB's by 8080 and PHC-Fing

PCB's by 8080 and PHC-Fing

PAH Screen

PAH Screen

CZA-13,S-2/CZA-11,S-4/CZA-9,S-1/CZA-10,S-1: TPH-GC/FID[⊗]

NOTES:

⊗ hold for possible FP

Requested By Don Giuliano

Date/Time 2-27-92 / 15:30

② - PO + Chain of Custody
12854

① Composite A (Contract Lab)

Matrix
GZA-13 S-1, GZA-13 S-2
GZA-11 S-1, GZA-11 S-2, GZA-11 S-3
(5 subsamples into one composite)
TCLP Metals and Flash point

② Composite B (Contract Lab)

Matrix
GZA-9 S-1
GZA-10 S-1
GZA-12 S-1
(3 subsamples into one composite)

TCLP metals & Flash point

③ Composite A (GZA ECL)

GZA-13 S-1 & S-2
GZA-11 S-1, 2, & 3
(5 into one comp.)
PCB's by 8080 & PHE Fingerprint

④ Composite B (GZA ECL)
GZA-9 S-1, GZA-10 S-1, GZA-12 S-1
3 samples into one comp.
PCB's by 8080 & PHE FP

⑤ PAH Screen - Composite I

GZA-13 S-1 and GZA-13 S-2
2 samples into one composite
PAH Screen

⑥ Composite 2
GZA-9 S-1, GZA-10 S-1
2 samples into one comp.
PAH Screen

⑦ 4 Samples TPH-GC quant. only - hold for possible
GZA-13 S-2, GZA-11 S-4, GZA-9 S-1, GZA-10 S-1

**GZA HYDROCARBON FINGERPRINTING TECHNIQUE
BY GAS CHROMATOGRAPHY-FLAME IONIZATION DETECTION
(PHC FINGERPRINT, GC-FID)**

OVERVIEW

The methodology employed by GZA to determine hydrocarbon content in solid and aqueous environmental samples is a modification of ASTM Method D3328-78 in conjunction with a method developed by the U.S. Coast Guard. Data obtained by this method include an accurate total concentration of hydrocarbon content and an identification based on comparisons with laboratory petroleum standards. Identifications may also be made utilizing a virgin petroleum product acquired from a suspected source at the site.

METHODOLOGY

Solid samples are extracted using a 30 gram subsample which is initially mixed with anhydrous sodium sulfate (Na_2SO_4) to remove water from the matrix. The sample is subsequently mixed with pentane to form a slurry which is then extracted via sonic disruption. This process is repeated three times and the collected extract is cleaned up using a silica gel solid phase extraction (SPE) column. The collected elutriate is automatically concentrated to a 1 milliliter volume with a Zymark Turbovap Evaporator to enhance detection limits of the method. Aqueous samples are extracted using a 200ml aliquot in a liquid/liquid extraction device using the solvent pentane. The extraction is repeated three times and the resulting extract is prepared following the same method as with solid environmental samples.

INSTRUMENTATION

The prepared extract is analyzed for hydrocarbon content using a Hewlett Packard Model 5890A Gas Chromatograph equipped with twin flame ionization detectors and a dual column capillary inlet system. The two Megabore capillary columns chosen for the analysis are a 30meter DB-5 and a 30meter DB-1. The sixty-five minute analysis is electronically controlled by a HP 7673A Autosampler and data are acquired with a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data are then transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatographic Software. The information for the analytical report is entered manually onto a Lotus Symphony Spreadsheet. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, and duplicates.

QUALITY CONTROL

The gas chromatograph is calibrated using an average response factor determined for hydrocarbons that is calculated from internal and surrogate standards. The calibration is checked with every batch of samples by analyzing petroleum hydrocarbons of known concentration. Identification of petroleum product type is made by comparison with laboratory standards or with suspect petroleum sources on an individual site basis. Tracer compounds such as the isomer pair phytane/ n-octadecane are routinely used to

determine the degree of product "weathering" as in the case of fuel oil number 2. The surrogate standard o-terphenyl is added to samples and method blanks to determine the extraction efficiency of the applied method as a surrogate recovery.

REPORT FORMAT

The method detection limit for total hydrocarbon content has been determined empirically and is modified for each sample as a function of the dilution factor. The total concentration is summarized in the row labeled "Hydrocarbon Content". All reported results for hydrocarbon analysis environmental samples are reported in ug/g (ppm) unless otherwise indicated. Detection limits for individual hydrocarbons are reported for the purpose of determining levels of priority pollutant constituents of petroleum such as polycyclic aromatic hydrocarbons (PAH's). Surrogate recoveries are reported for all method blanks and samples.

DISCLAIMER

Identities and concentrations of petroleum hydrocarbons reported in this analytical method are subject to the limitations inherent in the cited methods. This method is not an approved EPA method but is currently undergoing a review by the ASTM Committee D-29 on water for upgrades and certification.

LABORATORY CONTACT PERSON:

Edward W. Pickering, Manager
Environmental Chemistry Laboratory
GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Telephone#: (617) 969-0050, x 169

REFERENCES

ASTM, "Standard Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography," Designation D3328, (1982).

U.S. Coast Guard, "Oil Spill Identification System by Gas Chromatography," Report No.: CG-D-52-77, (1977)

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c.21E", Policy #WSC-89-004 (1990).

U.S. Coast Guard, "Analytical Method for Oil Spill Identification by Gas Chromatography", Central Oil Identification Laboratory (1988).

U.S. EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 Third Edition, Volume 1B, Method 3550: Sonication Extraction, Method 3630: Silica Gel Clean up (1986).

1/91/DM

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-2,S-5
GZA LAB #:	070391-QC	01827-IR
1. HYDROCARBON CONTENT	<10	69
2. PERCENT SOLID CONTENT	N/A	73
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. L. Hines* REVIEWED BY: *K. W. Aul*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-2,S-13
GZA LAB #:	070391-QC	01828-IR
1. HYDROCARBON CONTENT	<10	72
2. PERCENT SOLID CONTENT	N/A	95
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Mulhrew* REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-4,S-1
GZA LAB #:	070391-QC	01829-IR
1. HYDROCARBON CONTENT	<10	5400
2. PERCENT SOLID CONTENT	N/A	99
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Tumbler* REVIEWED BY: *L. Waller*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-2,S-2
GZA LAB #:	070391-QC	01825-IR
1. HYDROCARBON CONTENT	<10	1000
2. PERCENT SOLID CONTENT	N/A	97
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Finkler*

REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-2,S-3
GZA LAB #:	070391-QC	01826-IR
1. HYDROCARBON CONTENT	<10	2900
2. PERCENT SOLID CONTENT	N/A	83
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Furbur* REVIEWED BY: *K. Walsh*

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(617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-4,S-2
GZA LAB #:	070391-QC	01830-IR
1. HYDROCARBON CONTENT	<10	1600
2. PERCENT SOLID CONTENT	N/A	93
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Fiedler* REVIEWED BY: *K. White*

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320 NEEDHAM STREET
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(617) 969-0050
MASSACHUSETTS LABORATORY I.D. NO. MA092

EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-5,S-3
GZA LAB #:	070391-QC	01831-IR
1. HYDROCARBON CONTENT	<10	18
2. PERCENT SOLID CONTENT	N/A	81
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Tulkner* REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-7,S-2
GZA LAB #:	070391-QC	01832-IR
1. HYDROCARBON CONTENT	<10	97
2. PERCENT SOLID CONTENT	N/A	97
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Fulkner* REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-7,S-3
GZA LAB #:	070391-QC	01833-IR
1. HYDROCARBON CONTENT	<10	85
2. PERCENT SOLID CONTENT	N/A	63
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *L. Fulkner* REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON
JOB #: 12547.1
DATE SAMPLED: 6/19-29/91
DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-7,S-5
GZA LAB #:	070391-QC	01834-IR
1. HYDROCARBON CONTENT	<10	25
2. PERCENT SOLID CONTENT	N/A	79
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Fuciner* REVIEWED BY: *K. Walsh*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACC-PARCEL-PINE ST. BOSTON

JOB #: 12547.1

DATE SAMPLED: 6/19-29/91

DATE TESTED: 7/3/91

SAMPLE NAME:	METHOD BLANK	GZA-8,S-1
GZA LAB #:	070391-QC	01835-IR
1. HYDROCARBON CONTENT	<10	77
2. PERCENT SOLID CONTENT	N/A	94
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Furbur* REVIEWED BY: *L. Waller*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-2, S-1
GZA LAB #:	061891-QC	01786-IR
1. HYDROCARBON CONTENT	<10	150
2. PERCENT SOLID CONTENT	N/A	91%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY:

A. Faulkner

REVIEWED BY:

Lu...

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-3, S-1
GZA LAB #:	061891-QC	01787-IR
1. HYDROCARBON CONTENT	<10	160
2. PERCENT SOLID CONTENT	N/A	93%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Faulstich* REVIEWED BY: *W. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-3, S-2
GZA LAB #:	061891-QC	01788-IR
1. HYDROCARBON CONTENT	<10	200
2. PERCENT SOLID CONTENT	N/A	91%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *L. Kulhner* REVIEWED BY: *M. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-5, S-5
GZA LAB #:	061891-QC	01789-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	80%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Tucker* REVIEWED BY: *R. Waller*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-5, S-6
GZA LAB #:	061891-QC	01790-IR
1. HYDROCARBON CONTENT	<10	75
2. PERCENT SOLID CONTENT	N/A	81%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *H. Faulkner* REVIEWED BY: *L. Walsh*

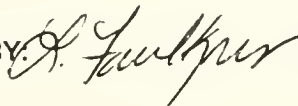
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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/15/91
DATE TESTED: 6/18/91

SAMPLE NAME:	METHOD BLANK	GZB-6, S-3
GZA LAB #:	061891-QC	01791-IR
1. HYDROCARBON CONTENT	<10	1,500
2. PERCENT SOLID CONTENT	N/A	89%
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY:  REVIEWED BY: 

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-1,S-2
GZA LAB #:	062891-QC	01816-IR
1. HYDROCARBON CONTENT	<10	1000
2. PERCENT SOLID CONTENT	N/A	86
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Finkner* REVIEWED BY: *EW*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-1,S-3
GZA LAB #:	062891-QC	01817-IR
1. HYDROCARBON CONTENT	<10	510
2. PERCENT SOLID CONTENT	N/A	92
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Tucker* REVIEWED BY: *M. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-1,S-4
GZA LAB #:	062891-QC	01818-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	80
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Lankner* REVIEWED BY: *M. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-2,S-3
GZA LAB #:	062891-QC	01819-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	90
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Fulk* REVIEWED BY: *W. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-3,S-3
GZA LAB #:	062891-QC	01820-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	82
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. G. Grier* REVIEWED BY: *E. W. Allen*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-3,S-19
GZA LAB #:	062891-QC	01821-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	90
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *J. Furlong* REVIEWED BY: *K. Wall*

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC PARCEL B-BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/5-17/91
DATE TESTED: 6/29/91

SAMPLE NAME:	METHOD BLANK	GZB-4,S-5
GZA LAB #:	062891-QC	01822-IR
1. HYDROCARBON CONTENT	<10	<10
2. PERCENT SOLID CONTENT	N/A	81
3. MATRIX	N/A	SOIL
4. DETECTION LIMIT	10	10

COMMENTS:

ANALYZED BY: *A. Finkner* REVIEWED BY: *W. Allen*

EPA METHOD 418.1 PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE (SPECTROPHOTOMETRIC, INFRARED)

OVERVIEW

EPA Method 418.1 is a solvent extraction/ infrared spectrophotometric method for the quantification of petroleum hydrocarbons in aqueous or solid environmental samples. Solvent extraction with 1,1,2-trichloro-1,2,2-trifluoroethane (fluorocarbon 113 or Freon 113) removes mineral oils from the individual media and the collected extract is subsequently concentrated for analysis. An aliquot of the sample is placed on the infrared spectrophotometer where the absorbance of the sample is directly compared with the standards for quantification of Total Petroleum Hydrocarbons (TPH).

METHODOLOGY

A Tekmar Model TM-250 Sonic Disruptor is used to extract the petroleum hydrocarbons from the sample matrix into Freon 113. This procedure is repeated three times upon a thirty gram representative sample. The collected extract is then elutriated on a silica gel solid phase extraction (SPE) column to remove hydrocarbon content attributable to such interferences as animal greases and vegetable oils. The purified extract is then concentrated to a known volume using a Zymark Turbovap Evaporator. Absorbance data are acquired by a Foxboro Miran 1 FF Infrared Spectrophotometer which is equipped with a fixed wavelength of 3.4 microns and a cell with a pathlength of 10 mm. The sample is placed in the 10 mm cell and the absorbance is measured and compared with the daily calibration curve to obtain TPH values.

QUALITY CONTROL

The infrared spectrophotometer is calibrated each day with the appropriate standards and blanks. The data are entered into an HP Model 11C Programmable Calculator to determine the exact equation of the calibration curve. Method blanks are prepared two ways : 1 - sonicator blank using the disruptor horn, 2 - a blank of the silica gel SPE column. These blanks check for cross contamination.

REPORT FORMAT

The method quantification limit is 10 ppm (ug/g - soil) and 1 ppm (ug/ml - water). This limit is a function of the dilution factor and detector sensitivity. The quantification limits are adjusted when dilutions are made to bring the sample response data within the calibration range of the method.

DISCLAIMER

Concentrations of petroleum hydrocarbons obtained by this solvent extraction and infrared spectrophotometric technique are subject to limitations inherent to this method. If confirmation is desired, replicate samples should be submitted for identification and enhanced quantification by PHC-Fingerprinting (GC-FID).

LABORATORY CONTACT PERSON:

Edward W. Pickering, Manager
Environmental Chemistry Laboratory
GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Phone: (617) 969-0050, x169

REFERENCES

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c. 21E", Policy #WSC-89-004 (1990).

Standard Methods "For the Examination of Water and Wastewater", Seventeenth Edition, Part 5000, 5520F Hydrocarbons, (1989) 5-47 to 5-48.

U.S. EPA "Handbook for Analytical Quality Control in Water and Waste Water Laboratories", EP-600/4-79-019 (1979).

U.S. EPA "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, Chap. 400, Method 418.1, Petroleum Hydrocarbons, Total Recoverable, (1979).

U.S. EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, Volume 1B, Method 3550: Sonication Extraction, Method 3630: Silica Gel Clean Up. (1986).

1/91/DM

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 2/24/92
 DATE TESTED: 3/2 & 4/92

GZA GEOENVIRONMENTAL, INC.
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 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/kg OR ug/L) SOIL

SAMPLE NAME:	METHOD BLANK	GZA-9 S-1	GZA-10 S-1	GZA-11 S-4	GZA-13 S-2		METHOD DETECTION LIMIT
GZA LAB #:	030492	04519-PAH	04520-PAH	04524-PAH	04525-PAH		
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	--580--	ND	--230--	--BMDL--		100
2. ACENAPHTHYLENE	ND	ND	ND	ND	ND		100
3. ACENAPHTHENE	ND	--970--	ND	--160--	--BMDL--		100
4. FLUORENE	ND	--950--	--110--	--1,100--	--210--		100
5. PHENANTHRENE	ND	--3,500--	--BMDL--	--5,600--	--660--		100
6. ANTHRACENE	ND	--910--	--270--	--1,600--	--140--		100
7. FLUORANTHENE	ND	--4,600--	--360--	--6,800--	--830--		100
8. PYRENE	ND	--6,300--	--370--	--7,500--	--910--		100
9. BENZO-A-ANTHRACENE	ND	--6,400--	ND	--4,300--	--480--		100
10. CHRYSENE	ND	--5,800--	ND	--3,200--	--400--		100
11. BENZO-B-FLUORANTHENE	ND	--9,200--	ND	--3,700--	--710--		100
12. BENZO-K-FLUORANTHENE	ND	--18,000--	ND	--3,900--	--940--		100
13. BENZO-A-PYRENE	ND	--5,200--	ND	--990--	--300--		100
14. INDENO-1,2,3-cd- PYRENE	ND	--5,300--	ND	--840--	--240--		100
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND	ND	ND	ND		200
2. DIETHYL PHTHALATE	ND	ND	ND	ND	ND		200
3. DI-N-BUTYL PHTHALATE	ND	ND	ND	ND	ND		200
4. BUTYL BENZYL PHTHALATE	ND	ND	ND	ND	ND		200
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND	ND	ND	ND		200
6. DIOCTYL PHTHALATE	ND	ND	ND	ND	ND		200
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND	ND	ND	ND	ND		200
2. BIS 2-ETHYL HEXYL ADIPATE	ND	ND	ND	ND	ND		200
TOTAL COMPOUNDS	ND	68,000	1,100	40,000	5,900		
SURROGATE RECOVERY	102%	Diluted Out	Diluted Out	Diluted Out	Diluted Out		

COMMENTS:

ANALYZED BY

R. Sanku

REVIEWED BY

H. Wall

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 2/24/92
 DATE TESTED: 3/2/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/kg OR ug/L) SOIL

SAMPLE NAME:	METHOD BLANK	COMP. A	COMP. B	COMP. 1	COMP. 2		METHOD DETECTION LIMIT
GZA LAB #:	030292	04515-PAH	04516-PAH	04517-PAH	04519-PAH		
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	--130--	--330--	ND	--290--		100
2. ACENAPHTHYLENE	ND	ND	ND	ND	ND		100
3. ACENAPHTHENE	ND	--830--	--760--	--700--	--760--		100
4. FLUORENE	ND	--1,000--	Trace	--660--	--540--		100
5. PHENANTHRENE	ND	--7,400--	--3,000--	--8,100--	--4,700--		100
6. ANTHRACENE	ND	--1,900--	--780--	--1,800--	--730--		100
7. FLUORANTHENE	ND	--9,100--	--3,200--	--13,000--	--3,000--		100
8. PYRENE	ND	--9,300--	--3,700--	--14,000--	--3,100--		100
9. BENZO-A-ANTHRACENE	ND	--5,300--	--2,800--	--7,100--	--1,800--		100
10. CHRYSENE	ND	--4,600--	--2,500--	--6,600--	--1,700--		100
11. BENZO-B-FLUORANTHENE	ND	--5,900--	--3,700--	--10,000--	--2,000--		100
12. BENZO-K-FLUORANTHENE	ND	--6,200--	--4,600--	--11,000--	--2,200--		100
13. BENZO-A-PYRENE	ND	--2,600--	--890--	--4,700--	--570--		100
14. INDENO-1,2,3-cd- PYRENE	ND	--2,500--	--1,300--	--4,000--	--800--		100
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND	ND	ND	ND		200
2. DIETHYL PHTHALATE	ND	ND	ND	ND	ND		200
3. DI-N-BUTYL PHTHALATE	ND	ND	ND	ND	ND		200
4. BUTYL BENZYL PHTHALATE	ND	ND	ND	ND	ND		200
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND	ND	ND	ND		200
6. DIOCTYL PHTHALATE	ND	ND	ND	ND	ND		200
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND	ND	ND	ND	ND		200
2. BIS 2-ETHYL HEXYL ADIPATE	ND	ND	ND	ND	ND		200
TOTAL COMPOUNDS	ND	57,000	28,000	82,000	22,000		
SURROGATE RECOVERY	95%	Diluted Out	Diluted Out	Diluted Out	Diluted Out		

COMMENTS:

ANALYZED BY

R. Soukup

REVIEWED BY

K. Wall

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 3/23/92
 DATE TESTED: 3/25/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/kg OR ug/L)

SAMPLE NAME:	METHOD BLANK	SS-1	SS-2				METHOD DETECTION LIMIT
GZA LAB #:	032592	04755-PAH	04756-PAH				
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	--190--	--69--				50
2. ACENAPHTHYLENE	ND	ND	ND				50
3. ACENAPHTHENE	ND	--320--	--110--				50
4. FLUORENE	ND	--310--	--130--				50
5. PHENANTHRENE	ND	--2,200--	--570--				50
6. ANTHRACENE	ND	--460--	--150--				50
7. FLUORANTHENE	ND	--6,700--	--1,200--				50
8. PYRENE	ND	--7,300--	--1,600--				50
9. BENZO-A-ANTHRACENE	ND	--4,700--	--1,000--				50
10. CHRYSENE	ND	--5,500--	--790--				50
11. BENZO-B-FLUORANTHENE	ND	--2,500--	--690--				50
12. BENZO-K-FLUORANTHENE	ND	--6,400--	--2,500--				50
13. BENZO-A-PYRENE	ND	--1,400--	--200--				50
14. INDENO-1,2,3-cd- PYRENE	ND	--850--	--500--				50
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND	ND				100
2. DIETHYL PHTHALATE	ND	ND	ND				100
3. DI-N-BUTYL PHTHALATE	ND	ND	ND				100
4. BUTYL BENZYL PHTHALATE	ND	ND	ND				100
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND	ND				100
6. DIOCTYL PHTHALATE	ND	ND	ND				100
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND						100
2. BIS 2-ETHYL HEXYL ADIPATE	ND						100
TOTAL COMPOUNDS	ND	39,000	9,500				
SURROGATE RECOVERY	87%	Diluted Out	Diluted Out				

COMMENTS:

ANALYZED BY

R. Souza

REVIEWED BY

K. Wall

CHAIN-OF-CUSTODY RECORD

[illegible]

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)

DATE/TIME

RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
<i>[Signature]</i>	3/23/92 12:00	<i>[Signature]</i>

DATE/TIME 12:00

RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
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DATE/TIME

RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

DATE/TIME

RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
------------------------------	-----------	--------------------------

DATE/TIME

RECEIVED BY: (Signature)

ANALYTICAL LABORATORY: _____

LABORATORY CONTACT: _____ PHONE: _____

PHONE:

GZA CONTACT: _____ EXT: _____

EXT:

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

320 Needham Street
NEWTON UPPER FALLS, MA 02164
(617) 959-0050
FAX (617) 965-7769

GZA FILE NO. 77-1047
PO. NO. 77-1047

73

PROJECT

PROJECT

LOCATION	
WV	

LOCATION

COLLECTOR(S)
Dr. (AD)

COLLECTOR'S

DATE(S) OF COLLECTION 2/12/07

DATE(S) OF COLLECTION

SHEET

ॐ

GZA SCREENING TECHNIQUE FOR THE DETERMINATION OF SEMI-VOLATILE COMPOUNDS IN AQUEOUS SAMPLES

OVERVIEW

The methodology employed by GZA to determine semi-volatile compound concentrations in aqueous samples was developed in accordance with guidelines specified for the Massachusetts Department of Environmental Quality Engineering (DEQE) for determining phthalate esters and adipates in aqueous samples. The method was subsequently expanded to encompass EPA Method 610 compounds, polyaromatic hydrocarbons (PAH's). As a whole the method is reliable for the determination of the above named semi-volatile compounds.

METHODOLOGY

A forty milliliter aliquot is removed from the sample and extracted in a two phase process. Phase one is the addition of 1ml of methanol to the forty ml sample. After agitating this mixture for one minute, using a Vortex Genie, the second solution of 4mls of hexane is added and the sample is re-agitated. The mixture is allowed to settle into phase layers for approximately one half hour before an aliquot of the hexane layer is removed for analysis.

INSTRUMENTATION

The prepared extract is analyzed for semi-volatile organic content using a HP 5890A Gas Chromatograph equipped with twin flame ionization detectors and a dual column capillary inlet system. The two Megabore capillary columns chosen for the analysis are a 30meter HP-1 and a 30meter DB-624. The fifty-five minute analysis is electronically controlled by a HP 7673A Autosampler and data is acquired with a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data is then transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatographic Software. The information for the analytical report is entered manually onto a Lotus Symphony Spreadsheet. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, and duplicates.

CALIBRATION

To demonstrate the extraction efficiency of the method the gas chromatograph was initially calibrated using external standards of semi-volatile spiking solutions. For daily calibration known standards are prepared in hexane at concentration levels that bracket the expected sample concentration. Sample peaks are identified by comparing retention times to the measured retention times of the calibration standards. Data must agree on both columns before positive identification of a semi-volatile compound may be made. Quantities are determined utilizing response factors yielded by the calibration.

REPORT FORMAT

The method detection limit for each compound has been determined empirically and is modified for each sample as a function of the dilution factor. The total concentration for all detected compounds is summarized in the row marked "Total Compounds". All reported results for semi-volatiles screening of aqueous samples are reported in ug/ml (ppm) unless otherwise indicated. Trace levels are those levels calculated between one and five times the stated detection limit.

DISCLAIMER

Identities and concentrations of semi-volatile compounds reported in this screening method are subject to the limitations inherent in this method. This method is not definitive and is not an EPA approved analytical. If confirmation is desired samples should be submitted to a State Certified Laboratory for analysis by the appropriate EPA protocol methods.

LABORATORY CONTACT PERSON

Edward W. Pickering
GZA GeoEnvironmental, Inc.
Environmental Chemistry Laboratory Manager
Telephone#: (617) 969-0050, x 169

1/91/DM

GZA GEOENVIRONMENTAL, INC.
320 NEEDHAM STREET
NEWTON UPPER FALLS, MA 02164
(617) 969-0050
MASS. I.D.# MA092

EPA 8080 ANALYSIS
POLYCHLORINATED BIPHENYLS (PCB'S)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA

JOB #:	12854	DATE SAMPLED:	2/24/92
SAMPLE #:	COMP. A	DATE TESTED:	3/2/92
LABORATORY #:	22766	DILUTION FACTOR:	0.2

8080 COMPOUNDS: POLYCHLORINATED BIPHENYLS	CONCENTRATION ug/kg-Soil (PPB)	DETECTION LIMIT ug/kg-Soil (PPB)
AROCLOR 1260	ND	10
AROCLOR 1254	ND	10
AROCLOR 1248	ND	10
AROCLOR 1242/1016	ND	10
AROCLOR 1232	ND	10
AROCLOR 1221	ND	10
SURROGATE RECOVERY (p'p'DDE)	54%	

COMMENTS:

ANALYZED BY:

R. Saito

REVIEWED BY:

L. Walz

GZA GEOENVIRONMENTAL, INC.
320 NEEDHAM STREET
NEWTON UPPER FALLS, MA 02164
(617) 969-0050
MASS. I.D.# MA092

EPA 8080 ANALYSIS
POLYCHLORINATED BIPHENYLS (PCB'S)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA

JOB #:	12854	DATE SAMPLED:	2/24/92
SAMPLE #:	COMP. B	DATE TESTED:	3/2/92
LABORATORY #:	22767	DILUTION FACTOR:	0.2

8080 COMPOUNDS: POLYCHLORINATED BIPHENYLS	CONCENTRATION ug/kg-Soil (PPB)	DETECTION LIMIT ug/kg-Soil (PPB)
AROCLOR 1260	--12--	10
AROCLOR 1254	ND	10
AROCLOR 1248	ND	10
AROCLOR 1242/1016	ND	10
AROCLOR 1232	ND	10
AROCLOR 1221	ND	10
SURROGATE RECOVERY (p'p'DDE)	57%	

COMMENTS:

ANALYZED BY:

R. Sarker

REVIEWED BY:

K. Walsh

GZA PCB/PESTICIDES SCREENING OF SOIL SAMPLES

OVERVIEW

The methodology employed by GZA to determine PCB or pesticide levels in soils is based upon EPA Method 8080 and a method developed by Dr. Thomas Spittler of the U.S. EPA in 1983. The procedure provides accurate results without the time consuming and hazardous aspects of Soxhlet extraction or sonication with methylene chloride. This procedure is termed a modified Method 8080 and yields accurate spike recoveries of Method 8080 recommended surrogates, which is a measure of extraction efficiency.

METHODOLOGY

An air dried soil sample is weighed out to 5g. ± 0.001 g. and is extracted in a two phase process. Phase one is the addition of 2 mls of a 4:1 solution of methanol/water to the 5 gm soil sample. After agitating this mixture for 1 min using a Vortex Genie the second solution of 4 ml of hexane is added and the sample is reagitated. The mixture is allowed to settle for 15 min. before it is "cleaned up" with a preparative column. The column consists of anhydrous sodium sulfate (to remove residual water) and oven dried Florisil (to remove apolar oil constituents). Two mls of the settled extract (hexane layer) are elutriated and a final rinse of the column is made with 2 ml of 10% Ethyl Ether/Hexane. The sample is eight-fifths (8/5) times diluted (vol/wt), cleaned, and ready for GC analysis.

INSTRUMENTATION

The prepared extract is then analyzed for PCB/Pesticide content using an HP-5890 Gas Chromatograph. The GC is equipped with a Nickel 63 Electron Capture Detector and a 3% SP2100 on 100/120 Supelcoport 1/4" glass column, the specified column in EPA Methods 608 and 8080. The half hour automatic analysis is electronically controlled by an HP-7673A Autosampler and data is acquired with a Nelson Analytical Series 2600 Software System. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, spike standards, and duplicates. The coherent data yielded by this system is interpreted by the analyst who determines through relative retention times and peak patterns the identity of the PCB/Pesticide present and through average areas the concentration of the unknown.

QUALITY CONTROL

The gas chromatograph is calibrated each time the autosampler is loaded to a maximum of forty samples including standards, blanks, etc. Calibration is based upon the expected range of sample concentrations. Two bracketing standards are run in duplicate. The response of these standards is used to calculate an average response factor. This response factor is used to determine the concentration of the unknowns along with the dilution factor created during extraction. Method blanks are run between every two samples and are prepared two ways: 1 -hexane from the reagent bottle, 2-a blank prepared as is the sample-extracted and elutriated. This checks apparatus cross contamination. To check extraction efficiency one out of every eight samples (or one per job) is spiked with a known concentration of the Method 608/8080 recommended surrogate P'P'DDE (for PCB applications only). The resulting concentration of this surrogate must be 70-130% when analyzed.

REPORT FORMAT

The method detection limit for PCB's is 50 ppb (ug/kg - soil) and for pesticides is 5 ppb (ug/kg - soil). This limit is a function of the dilution factor, detector sensitivity and inherent sample interferences. Any concentration calculated between one and five times the method detection limit is reported as trace. Any PCB or Pesticide not found is reported as ND.

DISCLAIMER

This method is employed by the GZA Environmental Chemistry Laboratory as a rapid, accurate, precise and cost effective analysis of soil samples for PCB's and Pesticides. However, this method is not definitive and is subject to limitations inherent to this method. If confirmation is desired, duplicate samples should be submitted to a State certified laboratory for analysis by the appropriate EPA protocol methods.

LABORATORY CONTACT PERSON:

Edward W. Pickering
GZA Geo Environmental, Inc.
Environmental Chemistry Laboratory Manager
Phone #: (617) 969-0050, x289

REFERENCES

- Boe, B. and Egaas, E., "Qualitative and Quantitative Analyses of Polychlorinated Biphenyls by Gas-Liquid Chromatography", Jour. Chromatography, 180 (1979) 127-132.
- Latady, A.L., K.M. Walsh, E.W. Pickering, and J.D. Okun, "Simplified Sample Preparation and Clean-up for PCB/Pesticide Analyses in Soils and Solid Wastes", Poster presented at the 5th Annual Waste Testing and Quality Assurance Symposium--Washington, D.C., July, 1989.
- Ogata, J.N., J.D. Okun, J.W. Hylin and A. Bevenue, "Gas Chromatographic Method for the Analysis of Polychlorinated Biphenyls in Transformer Oil", Jour. Chromatography, 189 (1980) 425-427.
- Spittler, T.M., "Field Measurement of PCB's in Soil and Sediment Using a Portable Gas Chromatograph", Paper presented at the 4th National Conference on Management of Hazardous Waste Sites--Washington, D.C., October, 1983.
- U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, Vol. 1B, Chap. 4.3.1., Method 8080, Organochlorine Pesticides and PCBs, (1986).

JULY 91/KW/DM/EWP



ANALYTICAL DATA
SUMMARY

Report Date: 03/10/92

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164
617-969-0050

Project Manager: D.Guiliano
Project Name: Washington St., Boston (12854.00)
Project No.: 12854.00

Lab Sample No.'s:

20581128-001

20581128-002

20581128-003

20581128-004

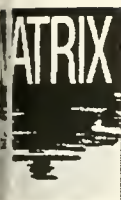
20581128-005

Reviewed by

Stephen DiMattei
Quality Assurance Officer

Lab Certifications

EPA ID: No. MA059
Connecticut: No. PH 0515
Florida: QA Plan No. 900437G
Maine: Reciprocity
Massachusetts: No. 313
New Hampshire: No. 24190-A,B
New York: ELAP No. 11116
Rhode Island: Reciprocity



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-001
Client Id: Composite A
Matrix: Soil

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
<u>SAMPLE PREPARATION</u>						
Metal Digestion	03/04/92			3020		
<u>TRACE METALS</u>						
Lead	265.0	mg/kg	0.1	7421	ja	03/05/92
<u>MISCELLANEOUS TESTING</u>						
Flash Point	> 220	Deg (F)		1010	jf	03/04/92



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

F I N A L R E P O R T

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-002
Client Id: Composite B
Matrix: Soil

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
<u>SAMPLE PREPARATION</u>						
Metal Digestion	03/04/92			3020		
<u>TRACE METALS</u>						
Lead	245.0	mg/kg	0.1	7421	ja	03/05/92



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-003
Client Id: Composite A
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
----------------------	--------	------	-----------------	------------	---------	---------------

SAMPLE PREPARATION

TCLP Extraction Date	02/27/92			1311	kp	
Metal Digestion	02/28/92			3020		
Hydride Digestion	02/28/92			3050		
Mercury Digestion	03/02/92			7470		

TRACE METALS

Arsenic	0.007	mg/l	0.005	7041	tl	03/02/92
Barium	0.43	mg/l	0.01	6010	tl	03/02/92
Cadmium	< 0.01	mg/l	0.01	6010	tl	03/02/92
Chromium	< 0.005	mg/l	0.005	7191	bg	03/02/92
Lead	0.230	mg/l	0.001	7421	sd	03/02/92
Mercury	< 0.001	mg/l	0.001	7471	mm	03/02/92
Selenium	< 0.005	mg/l	0.005	7741	tl	03/02/92
Silver	< 0.03	mg/l	0.03	6010	tl	03/02/92

PESTICIDES

Chlordane	ND	ug/l	1.00	8080	ss	03/05/92
Endrin	ND	ug/l	0.30	8080	ss	03/05/92
Gamma-BHC	ND	ug/l	0.30	8080	ss	03/05/92
Heptachlor	ND	ug/l	0.30	8080	ss	03/05/92
Heptachlor Epoxide	ND	ug/l	0.30	8080	ss	03/05/92
Methoxychlor	ND	ug/l	0.20	8080	ss	03/05/92
Toxaphene	ND	ug/l	1.30	8080	ss	03/05/92
Extraction Date:	03/03/92				kp	



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-003
Client Id: Composite A
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
<u>HERBICIDES</u>						
2,4-D	ND	ug/l	2.4	8150	ss	03/05/92
2,4,5-TP (Silvex)	ND	ug/l	2.1	8150	ss	03/05/92
Extraction Date:	03/03/92				rw	
<u>SURROGATE STUDIES - PESTICIDES/PCB</u>						
Sample ID:	20581128-003				ss	03/05/92
Dibutyl Chlorendate	90	Percent			ss	03/05/92



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-004
Client Id: Composite B
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
<u>SAMPLE PREPARATION</u>						
TCLP Extraction Date	02/27/92			1311	kp	
Metal Digestion	02/28/92			3020		
Hydride Digestion	02/28/92			3050		
Mercury Digestion	03/02/92			7470		
<u>TRACE METALS</u>						
Arsenic	< 0.005	mg/l	0.005	7041	tl	03/02/92
Barium	0.46	mg/l	0.01	6010	tl	03/02/92
Cadmium	< 0.01	mg/l	0.01	6010	tl	03/02/92
Chromium	< 0.005	mg/l	0.005	7191	bg	03/02/92
Lead	0.029	mg/l	0.001	7421	sd	03/02/92
Mercury	< 0.001	mg/l	0.001	7471	mm	03/02/92
Selenium	< 0.005	mg/l	0.005	7741	tl	03/02/92
Silver	< 0.03	mg/l	0.03	6010	tl	03/02/92
<u>PESTICIDES</u>						
Chlordane	ND	ug/l	1.00	8080	ss	03/05/92
Endrin	ND	ug/l	0.30	8080	ss	03/05/92
Gamma-BHC	ND	ug/l	0.30	8080	ss	03/05/92
Heptachlor	ND	ug/l	0.30	8080	ss	03/05/92
Heptachlor Epoxide	ND	ug/l	0.30	8080	ss	03/05/92
Methoxychlor	ND	ug/l	0.20	8080	ss	03/05/92
Toxaphene	ND	ug/l	1.30	8080	ss	03/05/92
Extraction Date:	03/03/92				kp	



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name: GZA

Sample Information

Lab ID: 20581128-004
Client Id: Composite B
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
HERBICIDES						
2,4-D	ND	ug/l	2.4	8150	ss	03/05/92
2,4,5-TP (Silvex)	ND	ug/l	2.1	8150	ss	03/05/92
Extraction Date:	03/03/92				rw	
SURROGATE STUDIES - PESTICIDES/PCB						
Sample ID:	20581128-004				ss	03/05/92
Dibutyl Chlorendate	93	Percent			ss	03/05/92



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name:

Sample Information

Lab ID: 20581128-005
Client Id: QC-Report
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
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DUPLICATE STUDIES

Arsenic Variance:	15	Percent
Barium Variance:	0	Percent
Cadmium Variance:	0	Percent
Chromium Variance:	0	Percent
Lead Variance:	2	Percent
Mercury Variance:	0	Percent
Selenium Variance:	0	Percent
Silver Variance:	0	Percent

MATRIX SPIKE STUDIES - METALS

Arsenic Recovery:	94	Percent
Barium Recovery:	82	Percent
Cadmium Recovery:	100	Percent
Chromium Recovery:	94	Percent
Lead Recovery:	107	Percent
Mercury Recovery:	80	Percent
Selenium Recovery:	109	Percent
Silver Recovery:	70	Percent

MATRIX SPIKE STUDIES - PESTICIDES/PCB

Sample ID:	20581128-005		
Chlordane	93	Percent	8080
Endrin	79	Percent	8080



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name:

Sample Information

Lab ID: 20581128-005
Client Id: QC-Report
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
MATRIX SPIKE STUDIES - PESTICIDES/PCB						
Gamma BHC	71	Percent		8080		
Heptachlor	71	Percent		8080		
Heptachlor Epoxide	79	Percent		8080		
Methoxychlor	111	Percent		8080		
Toxaphene	76	Percent		8080		

MATRIX SPIKE STUDIES - HERBICIDES

Sample ID:

20581128-005

2,4-D	41	Percent	8150
2,4,5-TP (Silvex)	47	Percent	8150

METHOD SUMMARIES

Metal analysis is performed on digested extracts using Atomic Absorption or ICP Spectroscopy. AA samples are atomized using FASTAC auto deposition and are automatically deposited into graphite cells or directly into flame. ICP samples are automatically sampled, nebulized, and transported into the plasma torch. Final results are produced by auto data/reduction and graphics printer.

Pesticide/PCB analysis is performed according to EPA 600 and SW846 protocol. Equipment includes H/P 5890 GC with ECD and autosampler. Data reduction is performed with H/P RTE 1000 computer systems.



Matrix Analytical, Inc.
106 South Street
Hopkinton, MA 01748
1 800 3-MATRIX

FINAL REPORT

Client Information

Account: GZA GeoEnvironmental, Inc.
Address: 320 Needham Street
Newton Upper Falls, MA 02164

Project Name: Washington St., Boston (12854.00)
Project Number: 12854.00
Project Manager: D. Guiliano
Sampler Name:

Sample Information

Lab ID: 20581128-005
Client Id: QC-Report
Matrix: TCLP
Comment: TCLP

Date Sampled: 02/27/92 :
Date Received: 02/27/92 : 0
Date Reported: 03/10/92

Analytical Parameter	Result	Unit	Detection Limit	Method No.	Analyst	Date Analyzed
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METHOD SUMMARIES

TCLP extractions are performed by SW846 protocol. Samples are processed for 18 hrs using auto rotators from Associated Design & Manufacturing Co. Inorganic and non-volatile species are processed in glass containers, while volatiles are processed in ZHE (Zero Headspace Extractors). Results are quantified and adjusted based upon matrix spike recoveries. Procedure adheres to June 29, 1990 Federal Register.

METHOD REFERENCES

1. Test Methods For Evaluating Solid Waste: Physical Chemical Methods. EPA SW 846. November 1986.
2. Methods For Chemical Analysis of Water and Wastes. EPA 600/4-79-200. Revised March 1983.
3. Standard Methods For Examination of Water and Wastewater. APHA-AWWA-WACF., 16th Edition. 1985.

WATER

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 3/9/92
 DATE TESTED: 3/9 & 10/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 LAB I.D. NO.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
 (CONCENTRATION - PPB, ug/l)

SAMPLE NAME: GZA LAB #:	Method Blank 08221-B	GZA-2 38221-A	GZB-5 38222-A				METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND	ND				10
2. TRICHLOROETHENE	ND	ND	ND				10
3. 1,1-DICHLOROETHENE	ND	ND	ND				10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND	ND				10
5. VINYL CHLORIDE	ND	ND	ND				10
6. METHYLENE CHLORIDE	ND	ND	ND				50
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND				10
8. 1,1-DICHLOROETHANE	ND	ND	ND				10
9. 1,2-DICHLOROETHANE	ND	ND	ND				50
10. CHLOROETHANE	ND	ND	ND				10
11. METHYL-t-BUTYL ETHER	ND	ND	ND				30
12. BENZENE	ND	ND	ND				5.0
13. TOLUENE	ND	ND	ND				5.0
14. ETHYL BENZENE	ND	ND	ND				5.0
15. m,p-XYLENES	ND	ND	ND				5.0
16. o-XYLENE	ND	ND	ND				5.0
17. CHLOROFORM	ND	ND	ND				50
18. FREON 113 (CCl3-CF3)	ND	ND	ND				20
19. CHLOROBENZENE	ND	ND	ND				10
20. STYRENE	ND	ND	ND				10
TOTAL COMPOUNDS (1-20)	ND	ND	ND				
METHANE (V/V-air, PPM)	ND	ND	ND				10 PPM
UNKNOWN(S) (#)	(1)	ND	(1)				

COMMENTS: Trace levels of one (1) early eluting unknown compound, which can be tentatively identified as methanol, were detected in the Method Blank and in sample "GZB-5". Results are reported with two (2) significant digits.

ANALYZED BY:

H. Muller

REVIEWED BY:

K. Walsh

JOB DESCRIPTION:	WASHINGTON STREET - BOSTON, MA	GZA GEOENVIRONMENTAL, INC.
JOB #:	12854	320 NEEDHAM STREET
DATE SAMPLED:	3/4/92	NEWTON UPPER FALLS, MA 02164
DATE TESTED:	3/5/92	(617) 969-0050

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
(CONCENTRATION - PPB, ug/l)

SAMPLE NAME:	Method Blank	GZA-4	GZA-12	GZA-13	GZB-1		METHOD DETECTION LIMIT
GZA LAB #:	08208-B	38209-A	38208-A	38210-A	38211-A		
1. TETRACHLOROETHENE	ND	ND	ND	ND	ND		10
2. TRICHLOROETHENE	ND	ND	ND	ND	ND		10
3. 1,1-DICHLOROETHENE	ND	ND	ND	ND	ND		10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND	ND	ND	ND		10
5. VINYL CHLORIDE	ND	ND	ND	ND	ND		10
6. METHYLENE CHLORIDE	ND	ND	ND	ND	ND		50
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND		10
8. 1,1-DICHLOROETHANE	ND	ND	ND	ND	ND		10
9. 1,2-DICHLOROETHANE	ND	ND	ND	ND	ND		50
10. CHLOROETHANE	ND	ND	ND	ND	ND		10
11. METHYL-t-BUTYL ETHER	ND	ND	ND	ND	ND		30
12. BENZENE	ND	ND	ND	ND	ND		5.0
13. TOLUENE	ND	ND	Trace	ND	ND		5.0
14. ETHYL BENZENE	ND	ND	--39--	ND	ND		5.0
15. m,p-XYLENES	ND	ND	--180--	Trace	Trace		5.0
16. o-XYLENE	ND	ND	--95--	ND	ND		5.0
17. CHLOROFORM	ND	ND	ND	ND	ND		50
18. FREON 113 (CCl3-CF3)	ND	ND	ND	ND	ND		20
19. CHLOROBENZENE	ND	ND	ND	ND	ND		10
20. STYRENE	ND	ND	ND	ND	ND		10
TOTAL COMPOUNDS (1-20)	ND	ND	310	Trace	Trace		
METHANE (V/V-air, PPM)	ND	4,600	ND	3,300	16		10 PPM
UNKNOWN(S) (#)	ND	(4)	(40)	(22)	(2)		

COMMENTS: Trace to low levels of one (1) early eluting unknown compound, which can be tentatively identified as methanol, were detected in samples "GZA-4", "GZA-12", "GZA-13" and "GZB-1". Methanol is a laboratory artifact that is inherent to this method and is most likely not present in samples "GZA-4", "GZA-12," GZA-13" and "GZB-1". Trace to low levels of three (3) late eluting, possibly semi-volatile, unknown compounds were detected in samples "GZA-4". The pattern of the chromatograms for samples "GZA-12" and "GZA-13" indicates the presence of one or more unknown petroleum distillates such as a gasoline and/or a fuel oil. Some of the above listed compounds may be present in sample "GZA-12" but their detection has been obscured by the complex nature of the chromatogram. Results are reported with two (2) significant digits.

ANALYZED BY:

J. Faulkner

REVIEWED BY:

W. Pulvering

JOB DESCRIPTION: WASHINGTON ST - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 2/24/92
 DATE TESTED: 2/25/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 LAB I.D. NO.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
 (CONCENTRATION - PPB, ug/l)

SAMPLE NAME: GZA LAB #:	Method Blank 08147-B	GZA-10 38147-A	GZA-11 38148-A				METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND	ND				10
2. TRICHLOROETHENE	ND	ND	ND				10
3. 1,1-DICHLOROETHENE	ND	ND	ND				10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND	ND				10
5. VINYL CHLORIDE	ND	ND	ND				10
6. METHYLENE CHLORIDE	ND	ND	ND				50
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND				10
8. 1,1-DICHLOROETHANE	ND	ND	ND				10
9. 1,2-DICHLOROETHANE	ND	ND	ND				50
10. CHLOROETHANE	ND	ND	ND				10
11. METHYL-t-BUTYL ETHER	ND	ND	ND				30
12. BENZENE	ND	ND	ND				5.0
13. TOLUENE	ND	ND	--36--				5.0
14. ETHYL BENZENE	ND	ND	ND				5.0
15. m,p-XYLENES	ND	ND	ND				5.0
16. o-XYLENE	ND	ND	ND				5.0
17. CHLOROFORM	ND	ND	ND				50
18. FREON 113 (CCl3-CF3)	ND	ND	ND				20
19. CHLOROBENZENE	ND	ND	ND				10
20. STYRENE	ND	ND	ND				10
TOTAL COMPOUNDS (1-20)	ND	ND	36				
METHANE (V/V-air, PPM)	ND	ND	6,400				10 PPM
UNKNOWN(S) (#)	ND	ND	(6)				

COMMENTS: Trace to moderate levels of six (6) variously eluting unknown compounds were detected in sample "GZA-11". Results are reported with two (2) significant digits.

ANALYZED BY:

J. Faulkner

REVIEWED BY:

CW Puhering

JOB DESCRIPTION: ACC - PARCEL A - BOSTON, MA
 JOB #: 12547.1
 DATE SAMPLED: 6/25/91 - 7/2/91
 DATE TESTED: 7/2/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050, x-289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
 (CONCENTRATION - PPB, ug/l)

SAMPLE NAME:	Method Blank	GZA-1	GZA-2	GZA-4	GZA-5		METHOD DETECTION LIMIT
GZA LAB #:	06476-B	36476-A	36477-A	36478-A	36479-A		
1. TETRACHLOROETHENE	ND	ND	ND	ND	ND		10
2. TRICHLOROETHENE	ND	ND	ND	ND	ND		10
3. 1,1-DICHLOROETHENE	ND	ND	ND	ND	ND		10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND	ND	ND	ND		10
5. VINYL CHLORIDE	ND	ND	ND	ND	ND		10
6. METHYLENE CHLORIDE	ND	ND	ND	ND	ND		50
7. 1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND		10
8. 1,1-DICHLOROETHANE	ND	ND	ND	ND	ND		10
9. 1,2-DICHLOROETHANE	ND	ND	ND	ND	ND		50
10. CHLOROETHANE	ND	ND	ND	ND	ND		10
11. METHYL-t-BUTYL ETHER	ND	ND	ND	ND	ND		30
12. BENZENE	ND	ND	ND	ND	ND		5.0
13. TOLUENE	ND	ND	ND	ND	ND		5.0
14. ETHYL BENZENE	ND	ND	ND	ND	ND		5.0
15. m,p-XYLENES	ND	ND	ND	ND	ND		5.0
16. o-XYLENE	ND	ND	ND	ND	ND		5.0
17. CHLOROFORM	ND	ND	ND	ND	ND		50
18. FREON 113 (CCI3-CF3)	ND	ND	ND	ND	ND		20
19. CHLOROBENZENE	ND	ND	ND	ND	ND		10
20. STYRENE	ND	ND	ND	ND	ND		10
TOTAL COMPOUNDS (1-20)	ND	ND	ND	ND	ND		
METHANE (V/V-air, PPM)	ND	ND	ND	12,000	7,100		10 PPM
UNKNOWN(S) (#)	ND	ND	ND	(5)	ND		

COMMENTS: Results are reported with two (2) significant digits. Trace to low levels of five (5) intermediate and late eluting unknown compounds were detected in sample GZA-4.

ANALYZED BY

Julie Blackwell

REVIEWED BY:

Ed Miller

JOB DESCRIPTION: CEDC - PARCEL A - BOSTON, MA
JOB #: 12547.1
DATE SAMPLED: 7/8/91
DATE TESTED: 7/9/91

GZA GEOENVIRONMENTAL, INC.
320 NEEDHAM STREET
NEWTON UPPER FALLS, MA 02164
(617) 969-0050, x-289
LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
(CONCENTRATION - PPB, ug/l)

SAMPLE NAME: GZA LAB #:	Method Blank 06546-B	GZA-8 36546-A					METHOD DETECTION LIMIT
1. TETRACHLOROETHENE	ND	ND					10
2. TRICHLOROETHENE	ND	ND					10
3. 1,1-DICHLOROETHENE	ND	ND					10
4. TOTAL 1,2- DICHLOROETHENES	ND	ND					10
5. VINYL CHLORIDE	ND	ND					10
6. METHYLENE CHLORIDE	ND	ND					50
7. 1,1,1-TRICHLOROETHANE	ND	ND					10
8. 1,1-DICHLOROETHANE	ND	ND					10
9. 1,2-DICHLOROETHANE	ND	ND					50
10. CHLOROETHANE	ND	ND					10
11. METHYL-t-BUTYL ETHER	ND	ND					30
12. BENZENE	ND	ND					5.0
13. TOLUENE	ND	ND					5.0
14. ETHYL BENZENE	ND	ND					5.0
15. m,p-XYLENES	ND	ND					5.0
16. o-XYLENE	ND	ND					5.0
17. CHLOROFORM	ND	ND					50
18. FREON 113 (CCl3-CF3)	ND	ND					20
19. CHLOROBENZENE	ND	ND					10
20. STYRENE	ND	ND					10
TOTAL COMPOUNDS (1-20)	ND	ND					
METHANE (V/V-air, PPM)	ND	11,000					10 PPM
UNKNOWN(S) (#)	ND	ND					

COMMENTS: Results are reported with two (2) significant digits.

ANALYZED BY *Celeste O'Connor*
for
JMB.

REVIEWED BY: *A. Kalarickal*
for EWP

JOB DESCRIPTION: ACDC. - PARCEL B - BOSTON, MA
 JOB #: 12535.1
 DATE SAMPLED: 6/19/91
 DATE TESTED: 6/20/91

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050, x-289
 LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
 (CONCENTRATION - PPB, ug/l)

SAMPLE NAME:	Method Blank	GZB-1	GZB-4	GZB-5			METHOD DETECTION LIMIT
GZA LAB #:	06363-B	36363-A	36364-A	36365-A			
1. TETRACHLOROETHENE							10
2. TRICHLOROETHENE							10
3. 1,1-DICHLOROETHENE							10
4. TOTAL 1,2-DICHLOROETHENES							10
5. VINYL CHLORIDE							10
6. METHYLENE CHLORIDE							50
7. 1,1,1-TRICHLOROETHANE							10
8. 1,1-DICHLOROETHANE							10
9. 1,2-DICHLOROETHANE							50
10. CHLOROETHANE							10
11. METHYL-t-BUTYL ETHER							30
12. BENZENE							5.0
13. TOLUENE							5.0
14. ETHYL BENZENE							5.0
15. m,p-XYLENES							5.0
16. o-XYLENE							5.0
17. CHLOROFORM							50
18. FREON 113 (CCl3-CF3)							20
19. CHLOROBENZENE							10
20. STYRENE							10
TOTAL COMPOUNDS (1-20)	ND	ND	ND	ND			
METHANE (V/V-air, PPM)	ND	19	ND	ND			10 PPM
UNKNOWN(S) (#)	ND	(8)	ND	ND			

COMMENTS: Results are reported with two (2) significant digits. Trace to low levels of eight (8) early and late eluting unknown compounds were detected in sample GZB-1.

ANALYZED BY

Y. Xiong for JMB

REVIEWED BY:

A. Katarly for CWP

JOB DESCRIPTION: ACDC. - PARCEL B - BOSTON, MA
JOB #: 12535.1
DATE SAMPLED: 6/21/91
DATE TESTED: 6/24/91

GZA GEOENVIRONMENTAL, INC.
320 NEEDHAM STREET
NEWTON UPPER FALLS, MA 02164
(617) 969-0050, x-289
LAB I.D. No.: MA092

GZA GC SCREENING FOR VOLATILE ORGANICS IN WATER
(CONCENTRATION - PPB, ug/l)

SAMPLE NAME:	Method	GZB-6					METHOD
GZA LAB #:	Blank	36388-A					DETECTION
	06388-B						LIMIT
1. TETRACHLOROETHENE							10
2. TRICHLOROETHENE							10
3. 1,1-DICHLOROETHENE							10
4. TOTAL 1,2-DICHLOROETHENES							10
5. VINYL CHLORIDE							10
6. METHYLENE CHLORIDE							50
7. 1,1,1-TRICHLOROETHANE							10
8. 1,1-DICHLOROETHANE							10
9. 1,2-DICHLOROETHANE							50
10. CHLOROETHANE							10
11. METHYL-t-BUTYL ETHER							30
12. BENZENE							5.0
13. TOLUENE							5.0
14. ETHYL BENZENE							5.0
15. m,p-XYLENES							5.0
16. o-XYLENE							5.0
17. CHLOROFORM							50
18. FREON 113 (CCl3-CF3)							20
19. CHLOROBENZENE							10
20. STYRENE							10
TOTAL COMPOUNDS (1-20)	ND	ND					
METHANE (V/V-air, PPM)	ND	ND					10 PPM
UNKNOWN(S #)	ND	ND					

COMMENTS: Results are reported with two (2) significant digits.

ANALYZED BY

W. Wong for JMB

REVIEWED BY:

*A. Katarly for
awp*

2901

TOTAL NUMBER OF CONTAINERS

Please send results to J. Boran
Ex 4237

Total # of Cont.	Note #
------------------------	-----------

CHAIN-OF-CUSTODY RECORD

Sample I.D.	Time (24hr.)	Bailer #	Collector's Initials	Location Description	Sample Type	ANALYSES REQUIRED														Total # of Cont.	Note #				
						524.2	8240	8010	8015	8020	8080	8270 C/PAL	GC Screen	PCB Screen	TCLP	TPH-IR	TPH-GC	HC-Fing.	HNu			pH	Spec. Cond.	Filtering	
GZA-4			DS		420																			4	1
GZA-12																								5	1
GZA-13																								3	1
GZB-1																								4	1

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)

ANALYTICAL LABORATORY: _____

LABORATORY CONTACT: _____ PHONE: _____

GZA CONTACT: Boisjoly EXT: 6237

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

320 Needham Street
NEWTON UPPER FALLS, MA 02164
(617) 552-0000

NOTES, Preservatives, etc.:
Unless otherwise noted, all VOA vials have been preserved w/ 1:1 HCl in accordance with Mass-DEP Policy.
1. of detectable lead, van Aringa-print

GZA FILE NO 128524 PO NO _____

PROJECT Washington St, Boston

LOCATION Boston

COLLECTOR(S) DSG

DATE OF COLLECTION 3-4-03

ANALYSES REQUIRED

[illegible]

203-204 June, 7-13

Sample I.D.	Time (24hr.)	Beaker #	Collector's Initials	Location Description	Sample Type	ANALYSES REQUIRED														Total # of Cont.	Note #		
						52A.2	8240	8010	8020	8080	8270	GC Screen	PCB Screen	TCLP	TPH-IR	TPH-GC	PHC-Fing.	HNU	pH			Spec. Cond. Filtering	Hold Analytical
G2A.1			MAK		H ₂ O						X							X	X			5	
G2A.2			MAK								X							X	X			5	
G2A.4			MAK								X							X	X			5	
G2A.5			MAK								X							X	X			5	
G2A.4,5.9A			MAK													X							
									</														

NOTES, Preservatives, etc.:
 Unless otherwise noted, all VOA vials have been preserved w/ 1:1 HCl in accordance with Mass-DEP Policy.

RELINQUISHED BY: (Signature) [Signature] DATE/TIME 7.2.91/0920 RECEIVED BY: (Signature) [Signature]

RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

ANALYTICAL LABORATORY: GZA ECL

GZA FILE NO. 12547.1 PO. NO. _____

LABORATORY CONTACT: _____ PHONE: _____

GZA CONTACT: _____ EXT: _____

PROJECT ACC. AREA 1

LOCATION CHINA TOWN / BOSTON, MA

COLLECTOR(S) M. A. FORTY, JR.

DATE OF COLLECTION: 7-2-91/6.25.91

SHEET 1 OF 1

GZA GEOENVIRONMENTAL, INC.
 ENGINEERS AND SCIENTISTS
 320 Needham Street
 NEWTON UPPER FALLS, MA 02164

GZA RAPID VOLATILE ORGANIC SCREENING OF WATER SAMPLES BY THE STATIC HEADSPACE TECHNIQUE

SAMPLE PREPARATION AND ANALYTICAL METHODOLOGY

OVERVIEW

The GZA rapid screening technique for volatile organics in water estimates aqueous concentrations of these compounds from gaseous concentrations measures in air over the sample. Dissolved volatile organics are driven from the water phase by equilibrating at an elevated temperature in a hermetic system containing the sample and clean air. An aliquot of the equilibrated headspace gas is injected into the chromatograph to provide an evaluation of the quality of the water sample. This method has been developed by the GZA Environmental Chemistry Laboratory to provide rapid and cost effective screening of water samples for volatile organics. Although this technique is a modification of EPA Method 3810, it is not definitive and is not approved by the EPA for certification purposes.

METHODOLOGY

Water samples taken in the field are placed in 40 ml glass septum vials filled to capacity and capped to exclude air bubbles. Vials are preserved with 250 μ l of 1:1 hydrochloric acid and samples are kept at 4 degrees C until the time of analysis. In preparing the sample for analysis, a volume ratio of 3:1 sample to headspace (air) is created by discarding 10 ml of sample (replaced by air) from the 40 ml vial or transferring 7.5 ml to a 10 ml crimp-top septum vial. The vial is resealed and heated to 40 degrees C in a thermostatically controlled bath. A 1.0 ml aliquot of headspace gas is withdrawn manually with a syringe or automatically by a Hewlett Packard 19395A headspace injector. The headspace sample is injected into the sample port of a HP 5890A gas chromatograph where the vapor is split within the injection port and distributed to two 30 meter x 530 micron fused silica capillary columns. Concentrations of eluting volatile organics are measured with dual flame ionization detectors and response data are acquired by a Nelson Analytical 760 Series intelligent interface. The chromatographic data are transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatography Software. The information for the analytical report is entered manually onto a Lotus Symphony spreadsheet.

CALIBRATION

The response of the gas chromatograph is calibrated with external standards prepared for concentrations of 0.1, 1.0 and 10 mg/l (ppm) and introduced into the chromatograph as headspace samples in the same manner as unknown water samples. Sample peaks are identified by comparing their retention times from both columns to measures retention times of calibration standards for both columns. Qualitative comparisons are made between the two sets of test data for each sample. Sample peaks identified as known compounds are quantified according to response factors determined from calibration standards.

REPORT FORMAT

The method detection limit (MDL) for each compound is stated for every report with 95% certainty in an average chromatographic run. The method quantitation limit (MQL) is considered to be 5 times the MDL. Concentrations measured in the range of 1 to 5 times the MDL are reported as "TRACE". Concentrations less than the MDL may be identified and qualified as beneath the method detection limit (BMDL) in instances where the compound's presence is 95% certain in that particular chromatogram. The total concentration for all detected compounds for which a calibration has been made, except methane, is summarized in the row designated as "Total Compounds"; none detected, (ND) is reported if no known peaks are found. Unidentifiable peaks are reported in parentheses as the number of unknown peaks present. Compounds not detected are reported as "ND".

QUALITY CONTROL

The GZA procedure assumes that response factors are constant over the working range of 10 ppb to 10 ppm and that the precision of the analysis for samples is the same as that for the calibration standards. The 95% confidence limits for a measurement are defined as plus or minus two standard deviations as determined by a Student's t Test on replicate analyses of calibration standards. Quality control standards are analyzed daily and accepted if the relative standard deviation of the response factor is less than 20% of the anticipated value. New calibration curves are prepared when quality control limits are exceeded. Method blanks are prepared in the same manner as samples and are analyzed before each job or no less frequently than every six samples. Field blanks and trip blanks are submitted at the discretion of the sample submitter. Matrix spikes and duplicate analyses are performed at a frequency of not less than one per twenty or fewer samples and results are reported as matrix spike recoveries and percent differences. Analytical results are not blank corrected.

DISCLAIMER

Identities and concentrations of volatile organic compounds reported by this headspace screening technique are subject to limitations inherent to this method. If confirmation is desired, duplicate samples should be submitted to a State certified laboratory for analysis by the appropriate EPA protocol methods.

LABORATORY SAMPLE NOTATION:

A - Aqueous

B - Blank

LABORATORY CONTACT PERSON:

Edward W. Pickering, Manager
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GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Phone #: (617) 969-0050 x169

REFERENCES

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c. 21E", Policy #WSC-89004 (1990).

Ettre, L.S., B. Kolb, and S.G. Hurt, "Techniques of Headspace Gas Chromatography," Am. Lab. 15 (10), 76-83, (1983).

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McNally, M.E., and R.L. Grob, "A Review: Current Applications of Static and Dynamic Headspace Analysis: Part One: Environmental Applications," Am. Lab. 17 (1) 20-33, (1985).

Spittler, T.M., R. Siscanaw, M. Lataille, and P.A. Parks, "Correlation Between Field GC Measurement of Volatile Organics and Laboratory Confirmation of Collected Field Samples Using GC/MS," Paper presented at 11/82 Washington, D.C. Hazardous Materials Control Research Institute Conference.

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, Volume 1B, Method 3810: Headspace (1986).

Wylie, P.L., "Trace Analysis of Volatile Compounds in Water Using the HP 19395A Headspace Sampler", Hewlett-Packard Application Note AN 228-40 (1985).

Wylie, P.L., "Comparing Headspace with Purge and Trap for Analysis of Volatile Priority Pollutants", Jour. AWWA 80:8:65, (1988).

6/91/EWP-DM

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 3/9/92

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	93.1	70-130	3.7	35
Toluene	105.7	70-130	2.6	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 3/5/92

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	100.4	70-130	25	35
Toluene	100.2	70-130	25.9	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 2/25/92

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	90.9	70-130	16.5	35
Toluene	86.5	70-130	1.19	35

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 7/2/91

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	92.0	70-130	10.7	35
Toluene	93.0	70-130	12.2	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 6/21/91

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	87.2	70-130	0.3	35
Toluene	85.7	70-130	0.6	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

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GZA GAS CHROMATOGRAPHIC SCREENING FOR VOLATILE ORGANICS
IN AQUEOUS AND/OR SOLID MATRIX
QUALITY CONTROL

DATE: 6/20/91

AQUEOUS

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	88.3	70-130	2.5	35
Toluene	87.8	70-130	6.2	35

SOLID

COMPOUNDS	MATRIX SPIKE RECOVERY (%)	ACCEPTANCE LIMITS (%)	DUPLICATE SPIKE PERCENT DIFFERENCE (%)	ACCEPTANCE LIMITS (%)
Trichloroethene	---	70-130	---	35
Toluene	---	70-130	---	35

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/9/92
DATE TESTED: 3/13/92

SAMPLE NAME:	METHOD	GZA-2
GZA LAB #:	BLANK	
	031392-QC	04622-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	118%	125%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

R. Soukup

REVIEWED BY:

Walt

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/4/92
DATE TESTED: 3/11/92

SAMPLE NAME:	METHOD	GZA-4
GZA LAB #:	BLANK	
	031192 -QC	04584-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	110%	95%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

P. Soules

REVIEWED BY:

K. Walsh

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/9/92
DATE TESTED: 3/13/92

SAMPLE NAME:	METHOD BLANK	GZB-5
GZA LAB #:	031392-QC	04623-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	118%	103%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

R. Soukup

REVIEWED BY:

K. Wall

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/4/92
DATE TESTED: 3/11/92

SAMPLE NAME: GZA LAB #:	METHOD BLANK 031192 -QC	GZA-12 04585-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	110%	87%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

R. S. S. S.

REVIEWED BY:

K. Walsh

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/4/92
DATE TESTED: 3/11/92

SAMPLE NAME:	METHOD	GZA-13
GZA LAB #:	BLANK	
	031192 -QC	04586-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	110%	89%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

R. Soukup

REVIEWED BY:

K. Walsh

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HYDROCARBON FINGERPRINTING
MODIFIED ASTM METHOD D3328
CONCENTRATION (PPM-ug/g or ug/ml)

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
JOB #: 12854
DATE SAMPLED: 3/4/92
DATE TESTED: 3/5/92

SAMPLE NAME:	METHOD	GZB-1
GZA LAB #:	BLANK	
	030592 -QC	04549-PHC
1. HYDROCARBON CONTENT	<0.5	<0.5
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT (TOTAL PRODUCT)	0.5	0.5
5. DETECTION LIMIT (INDIVIDUAL HYDROCARBONS)	0.02	0.02
6. SURROGATE RECOVERY (O-TERPHENYL)	110%	62%

QUALITATIVE IDENTIFICATION: N/A

ANALYZED BY:

P. S. S. S.

REVIEWED BY:

K. Walch

**GZA HYDROCARBON FINGERPRINTING TECHNIQUE
BY GAS CHROMATOGRAPHY-FLAME IONIZATION DETECTION
(PHC FINGERPRINT, GC-FID)**

OVERVIEW

The methodology employed by GZA to determine hydrocarbon content in solid and aqueous environmental samples is a modification of ASTM Method D3328-78 in conjunction with a method developed by the U.S. Coast Guard. Data obtained by this method include an accurate total concentration of hydrocarbon content and an identification based on comparisons with laboratory petroleum standards. Identifications may also be made utilizing a virgin petroleum product acquired from a suspected source at the site.

METHODOLOGY

Solid samples are extracted using a 30 gram subsample which is initially mixed with anhydrous sodium sulfate (Na_2SO_4) to remove water from the matrix. The sample is subsequently mixed with pentane to form a slurry which is then extracted via sonic disruption. This process is repeated three times and the collected extract is cleaned up using a silica gel solid phase extraction (SPE) column. The collected elutriate is automatically concentrated to a 1 milliliter volume with a Zymark Turbovap Evaporator to enhance detection limits of the method. Aqueous samples are extracted using a 200ml aliquot in a liquid/liquid extraction device using the solvent pentane. The extraction is repeated three times and the resulting extract is prepared following the same method as with solid environmental samples.

INSTRUMENTATION

The prepared extract is analyzed for hydrocarbon content using a Hewlett Packard Model 5890A Gas Chromatograph equipped with twin flame ionization detectors and a dual column capillary inlet system. The two Megabore capillary columns chosen for the analysis are a 30meter DB-5 and a 30meter DB-1. The sixty-five minute analysis is electronically controlled by a HP 7673A Autosampler and data are acquired with a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data are then transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatographic Software. The information for the analytical report is entered manually onto a Lotus Symphony Spreadsheet. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, and duplicates.

QUALITY CONTROL

The gas chromatograph is calibrated using an average response factor determined for hydrocarbons that is calculated from internal and surrogate standards. The calibration is checked with every batch of samples by analyzing petroleum hydrocarbons of known concentration. Identification of petroleum product type is made by comparison with laboratory standards or with suspect petroleum sources on an individual site basis. Tracer compounds such as the isomer pair phytane/ n-octadecane are routinely used to

determine the degree of product "weathering" as in the case of fuel oil number 2. The surrogate standard o-terphenyl is added to samples and method blanks to determine the extraction efficiency of the applied method as a surrogate recovery.

REPORT FORMAT

The method detection limit for total hydrocarbon content has been determined empirically and is modified for each sample as a function of the dilution factor. The total concentration is summarized in the row labeled "Hydrocarbon Content". All reported results for hydrocarbon analysis environmental samples are reported in ug/g (ppm) unless otherwise indicated. Detection limits for individual hydrocarbons are reported for the purpose of determining levels of priority pollutant constituents of petroleum such as polyaromatic hydrocarbons (PAH's). Surrogate recoveries are reported for all method blanks and samples.

DISCLAIMER

Identities and concentrations of petroleum hydrocarbons reported in this analytical method are subject to the limitations inherent in the cited methods. This method is not an approved EPA method but is currently undergoing a review by the ASTM Committee D-29 on water for upgrades and certification.

LABORATORY CONTACT PERSON:

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REFERENCES

ASTM, "Standard Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography," Designation D3328, (1982).

U.S. Coast Guard, "Oil Spill Identification System by Gas Chromatography," Report No.: CG-D-52-77, (1977)

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c.21E", Policy #WSC-89-004 (1990).

U.S. Coast Guard, "Analytical Method for Oil Spill Identification by Gas Chromatography", Central Oil Identification Laboratory (1988).

U.S. EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 Third Edition, Volume 1B, Method 3550: Sonication Extraction, Method 3630: Silica Gel Clean up (1986).

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EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: ACDC - PARCEL B
JOB #: 12535.1
DATE SAMPLED: 6/19/91
DATE TESTED: 7/1/91

SAMPLE NAME:	METHOD BLANK	GZB-1
GZA LAB #:	070191-QC	01824-IR
1. HYDROCARBON CONTENT	<1	18
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT	1	1

COMMENTS:

ANALYZED BY: *A. Fushner*

REVIEWED BY: *[Signature]*

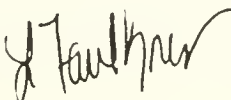
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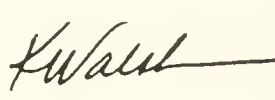
EPA METHOD 418.1 PETROLEUM HYDROCARBONS
(SPECTROPHOTOMETRIC, INFRARED)
PHC-IR
CONCENTRATION (PPM, ug/g or ug/ml)

JOB DESCRIPTION: CEDC PARCEL A- CHINATOWN, BOSTON
JOB #: 12547.1
DATE SAMPLED: 7/2/91
DATE TESTED: 7/19/91

SAMPLE NAME:	METHOD BLANK	GZA-4
GZA LAB #:	071991-QC	01866-IR
1. HYDROCARBON CONTENT	<1	<1
2. PERCENT SOLID CONTENT	N/A	N/A
3. MATRIX	N/A	AQUEOUS
4. DETECTION LIMIT	1	1

COMMENTS:

ANALYZED BY: 

REVIEWED BY: 

01596

CHAIN-OF-CUSTODY RECORD

Sample I.D.	Time (Date)	Bailer #	Collector's Initials	Location Description	Sample Type	ANALYSES REQUIRED															Total # of Cont.	Note #		
						524.2	8240	8010	8020	8080	8270	GC Screen	PCB Screen	TCLP	TPH-IR	TPH-GC	PHC-Fryg.	HNU	pH	Spec. Cond.			Filtering	
G2A.1			1143		H ₂ O						X												5	
G2A.2			1146		↓						X												5	
G2A.4			1148									X											5	
G2A.5			1148									X											5	
G2A.4, 5, 9A			1146										X										5	
																						</		

NOTES, Preservatives, etc.:
Unless otherwise noted, all VOA vials have been preserved w/ 1:1 HCl in accordance with Mass-DEP Policy.

RELINQUISHED BY: (Signature) [Signature] DATE/TIME 7/29/0920 RECEIVED BY: (Signature) [Signature]
 RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____
 RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____
 RELINQUISHED BY: (Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____
 ANALYTICAL LABORATORY: GZA CIL
 LABORATORY CONTACT: _____ PHONE: _____
 GZA CONTACT: _____ EXT: _____

GZA FILE NO 12547.1 PO NO _____
 PROJECT AKC BIRCEL A
 LOCATION CHANNING/ROSEN, MA
 COLLECTORS M.A. ROSEN, Jr
 DATE(S) OF COLLECTION 7-2-91/6-25-01 QUANTITY 1 107

EPA METHOD 418.1 PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE (SPECTROPHOTOMETRIC, INFRARED)

OVERVIEW

EPA Method 418.1 is a solvent extraction/ infrared spectrophotometric method for the quantification of petroleum hydrocarbons in aqueous or solid environmental samples. Solvent extraction with 1,1,2-trichloro-1,2,2-trifluoroethane (fluorocarbon 113 or Freon 113) removes mineral oils from the individual media and the collected extract is subsequently concentrated for analysis. An aliquot of the sample is placed on the infrared spectrophotometer where the absorbance of the sample is directly compared with the standards for quantification of Total Petroleum Hydrocarbons (TPH).

METHODOLOGY

A Tekmar Model TM-250 Sonic Disruptor is used to extract the petroleum hydrocarbons from the sample matrix into Freon 113. This procedure is repeated three times upon a thirty gram representative sample. The collected extract is then elutriated on a silica gel solid phase extraction (SPE) column to remove hydrocarbon content attributable to such interferences as animal greases and vegetable oils. The purified extract is then concentrated to a known volume using a Zymark Turbovap Evaporator. Absorbance data are acquired by a Foxboro Miran 1 FF Infrared Spectrophotometer which is equipped with a fixed wavelength of 3.4 microns and a cell with a pathlength of 10 mm. The sample is placed in the 10 mm cell and the absorbance is measured and compared with the daily calibration curve to obtain TPH values.

QUALITY CONTROL

The infrared spectrophotometer is calibrated each day with the appropriate standards and blanks. The data are entered into an HP Model 11C Programmable Calculator to determine the exact equation of the calibration curve. Method blanks are prepared two ways : 1 - sonicator blank using the disruptor horn, 2 - a blank of the silica gel SPE column. These blanks check for cross contamination.

REPORT FORMAT

The method quantification limit is 10 ppm (ug/g - soil) and 1 ppm (ug/ml - water). This limit is a function of the dilution factor and detector sensitivity. The quantification limits are adjusted when dilutions are made to bring the sample response data within the calibration range of the method.

DISCLAIMER

Concentrations of petroleum hydrocarbons obtained by this solvent extraction and infrared spectrophotometric technique are subject to limitations inherent to this method. If confirmation is desired, replicate samples should be submitted for identification and enhanced quantification by PHC-Fingerprinting (GC-FID).

LABORATORY CONTACT PERSON:

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Environmental Chemistry Laboratory
GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Phone: (617) 969-0050, x169

REFERENCES

Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c. 21E", Policy #WSC-89-004 (1990).

Standard Methods "For the Examination of Water and Wastewater", Seventeenth Edition, Part 5000, 5520F Hydrocarbons, (1989) 5-47 to 5-48.

U.S. EPA "Handbook for Analytical Quality Control in Water and Waste Water Laboratories", EP-600/4-79-019 (1979).

U.S. EPA "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, Chap. 400, Method 418.1, Petroleum Hydrocarbons, Total Recoverable, (1979).

U.S. EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, Volume 1B, Method 3550: Sonication Extraction, Method 3630: Silica Gel Clean Up. (1986).

1/91/DM

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 3/4/92
 DATE TESTED: 3/11/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/kg OR ug/L)

SAMPLE NAME:	METHOD BLANK	GZA-4	GZA-12	GZA-13			METHOD DETECTION LIMIT
GZA LAB #:	031192-QC	04584-PAH	04585-PAH	04586-PAH			
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	ND	ND	ND			5.0
2. ACENAPHTHYLENE	ND	ND	ND	ND			5.0
3. ACENAPHTHENE	ND	ND	ND	ND			5.0
4. FLUORENE	ND	ND	ND	ND			5.0
5. PHENANTHRENE	ND	ND	ND	ND			5.0
6. ANTHRACENE	ND	ND	ND	ND			5.0
7. FLUORANTHENE	ND	ND	ND	ND			5.0
8. PYRENE	ND	ND	ND	ND			5.0
9. BENZO-A-ANTHRACENE	ND	ND	ND	ND			5.0
10. CHRYSENE	ND	ND	ND	ND			5.0
11. BENZO-B-FLUORANTHENE	ND	ND	ND	ND			5.0
12. BENZO-K-FLUORANTHENE	ND	ND	ND	ND			5.0
13. BENZO-A-PYRENE	ND	ND	ND	ND			5.0
14. INDENO-1,2,3-cd- PYRENE	ND	ND	ND	ND			5.0
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND	ND	ND			10
2. DIETHYL PHTHALATE	ND	ND	ND	ND			10
3. DI-N-BUTYL PHTHALATE	ND	ND	ND	ND			10
4. BUTYL BENZYL PHTHALATE	ND	ND	ND	ND			10
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND	ND	ND			10
6. DIOCTYL PHTHALATE	ND	ND	ND	ND			10
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND	ND	ND	ND			10
2. BIS 2-ETHYL HEXYL ADIPATE	ND	ND	ND	ND			10
TOTAL COMPOUNDS	ND	ND	ND	ND			
SURROGATE RECOVERY	110%	95%	87%	89%			

COMMENTS:

ANALYZED BY

R. Soukup

REVIEWED BY

K. Walsh

JOB DESCRIPTION: WASHINGTON ST. - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 3/9/92
 DATE TESTED: 3/13/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/L-AQUEOUS)

SAMPLE NAME:	METHOD BLANK	GZB-5					METHOD DETECTION LIMIT
GZA LAB #:	031392-QC	04623-PAH					
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	ND					5.0
2. ACENAPHTHYLENE	ND	ND					5.0
3. ACENAPHTHENE	ND	ND					5.0
4. FLUORENE	ND	ND					5.0
5. PHENANTHRENE	ND	ND					5.0
6. ANTHRACENE	ND	ND					5.0
7. FLUORANTHENE	ND	ND					5.0
8. PYRENE	ND	ND					5.0
9. BENZO-A-ANTHRACENE	ND	ND					5.0
10. CHRYSENE	ND	ND					5.0
11. BENZO-B-FLUORANTHENE	ND	ND					5.0
12. BENZO-K-FLUORANTHENE	ND	ND					5.0
13. BENZO-A-PYRENE	ND	ND					5.0
14. INDENO-1,2,3-cd- PYRENE	ND	ND					5.0
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND					10
2. DIETHYL PHTHALATE	ND	ND					10
3. DI-N-BUTYL PHTHALATE	ND	ND					10
4. BUTYL BENZYL PHTHALATE	ND	ND					10
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND					10
6. DIOCTYL PHTHALATE	ND	ND					10
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND	ND					10
2. BIS 2-ETHYL HEXYL ADIPATE	ND	ND					10
TOTAL COMPOUNDS	ND	ND					
SURROGATE RECOVERY	118%	103%					

COMMENTS:

ANALYZED BY

R. Sothup

REVIEWED BY

K. Wall

JOB DESCRIPTION: WASHINGTON STREET - BOSTON, MA
 JOB #: 12854
 DATE SAMPLED: 2/24/92
 DATE TESTED: 3/6/92

GZA GEOENVIRONMENTAL, INC.
 320 NEEDHAM STREET
 NEWTON UPPER FALLS, MA 02164
 (617) 969-0050
 MASS ID#. MA092

GZA GC SCREENING FOR SEMI-VOLATILE ORGANICS
 (CONCENTRATION - PPB ug/kg OR ug/L) AQUEOUS

SAMPLE NAME:	METHOD BLANK	GZA-11					METHOD DETECTION LIMIT
GZA LAB #:	031192-QC	04585-PAH					
POLYAROMATIC HYDROCARBONS							
1. NAPHTHALENE	ND	ND					5.0
2. ACENAPHTHYLENE	ND	ND					5.0
3. ACENAPHTHENE	ND	ND					5.0
4. FLUORENE	ND	ND					5.0
5. PHENANTHRENE	ND	ND					5.0
6. ANTHRACENE	ND	ND					5.0
7. FLUORANTHENE	ND	ND					5.0
8. PYRENE	ND	ND					5.0
9. BENZO-A-ANTHRACENE	ND	--BMQL--					5.0
10. CHRYSENE	ND	--BMQL--					5.0
11. BENZO-B-FLUORANTHENE	ND	ND					5.0
12. BENZO-K-FLUORANTHENE	ND	ND					5.0
13. BENZO-A-PYRENE	ND	ND					5.0
14. INDENO-1,2,3-cd- PYRENE	ND	ND					5.0
PHTHALATES							
1. DIMETHYL PHTHALATE	ND	ND					10
2. DIETHYL PHTHALATE	ND	ND					10
3. DI-N-BUTYL PHTHALATE	ND	ND					10
4. BUTYL BENZYL PHTHALATE	ND	ND					10
5. BIS 2-ETHYL HEXYL PHTHALATE	ND	ND					10
6. DIOCTYL PHTHALATE	ND	ND					10
ADIPATES							
1. DI-N-HEXYL ADIPATE	ND	ND					10
2. BIS 2-ETHYL HEXYL ADIPATE	ND	ND					10
TOTAL COMPOUNDS	ND	--BMQL--					
SURROGATE RECOVERY	110%	87%					

COMMENTS:

ANALYZED BY

R. Sackup

REVIEWED BY

L. Walsh

ANALYSIS TRANSFER RECORD

JOB NUMBER 12854.00

PROJECT MANAGER Bossange

DATE SAMPLES CAME IN 2-24-92

TYPE OF CONTAINER Amber VOA DJ

SAMPLE TYPE Soil Water Air

SAMPLE ID

ANALYSIS

GZA-11

PAH analysis

NOTES: _____

Requested By D. Givlich

Date/Time 3-3-92/10:45

GZA SCREENING TECHNIQUE FOR THE DETERMINATION OF SEMI-VOLATILE COMPOUNDS IN AQUEOUS SAMPLES

OVERVIEW

The methodology employed by GZA to determine semi-volatile compound concentrations in aqueous samples was developed in accordance with guidelines specified for the Massachusetts Department of Environmental Quality Engineering (DEQE) for determining phthalate esters and adipates in aqueous samples. The method was subsequently expanded to encompass EPA Method 610 compounds, polyaromatic hydrocarbons (PAH's). As a whole the method is reliable for the determination of the above named semi-volatile compounds.

METHODOLOGY

A forty milliliter aliquot is removed from the sample and extracted in a two phase process. Phase one is the addition of 1ml of methanol to the forty ml sample. After agitating this mixture for one minute, using a Vortex Genie, the second solution of 4mls of hexane is added and the sample is re-agitated. The mixture is allowed to settle into phase layers for approximately one half hour before an aliquot of the hexane layer is removed for analysis.

INSTRUMENTATION

The prepared extract is analyzed for semi-volatile organic content using a HP 5890A Gas Chromatograph equipped with twin flame ionization detectors and a dual column capillary inlet system. The two Megabore capillary columns chosen for the analysis are a 30meter HP-1 and a 30meter DB-624. The fifty-five minute analysis is electronically controlled by a HP 7673A Autosampler and data is acquired with a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data is then transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatographic Software. The information for the analytical report is entered manually onto a Lotus Symphony Spreadsheet. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, and duplicates.

CALIBRATION

To demonstrate the extraction efficiency of the method the gas chromatograph was initially calibrated using external standards of semi-volatile spiking solutions. For daily calibration known standards are prepared in hexane at concentration levels that bracket the expected sample concentration. Sample peaks are identified by comparing retention times to the measured retention times of the calibration standards. Data must agree on both columns before positive identification of a semi-volatile compound may be made. Quantities are determined utilizing response factors yielded by the calibration.

REPORT FORMAT

The method detection limit for each compound has been determined empirically and is modified for each sample as a function of the dilution factor. The total concentration for all detected compounds is summarized in the row marked "Total Compounds". All reported results for semi-volatiles screening of aqueous samples are reported in ug/ml (ppm) unless otherwise indicated. Trace levels are those levels calculated between one and five times the stated detection limit.

DISCLAIMER

Identities and concentrations of semi-volatile compounds reported in this screening method are subject to the limitations inherent in this method. This method is not definitive and is not an EPA approved analytical. If confirmation is desired samples should be submitted to a State Certified Laboratory for analysis by the appropriate EPA protocol methods.

LABORATORY CONTACT PERSON

Edward W. Pickering
GZA GeoEnvironmental, Inc.
Environmental Chemistry Laboratory Manager
Telephone#: (617) 969-0050, x 169

1/91/DM

pH-CONDUCTIVITY REPORT

GZA GEOENVIRONMENTAL, INC., ENVIRONMENTAL CHEMISTRY LABORATORY
320 NEEDHAM STREET, NEWTON, MA 02169, (617) 969-0050

JOB NUMBER 12854

DATE/TIME IN: 3/4/92

PROJ. MNGR. BOSSANGE

DATE/TIME TESTED: 3/6/92 / 14:30

SAMPLE TYPE: AQUEOUS

LAB #	SAMPLE #	pH	CORRECTED CONDUCTIVITY
01002	GZA-12	6.56	1,440
01003	GZA-13	7.11	2,360

TESTED BY:

ANALYZED BY:

3/92

DATE/TIME IN: 2-24-95

TESTED BY: ML DATE/TIME TESTED: 2-26 1 10:00

COND. METER: ✓ YSI MODEL 34 CONDUCTANCE - RESISTANCE METER
OTHER: _____

CONDUCTIVITY PROBE CELL CONSTANT 1.03 PROBE - K 1.0

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